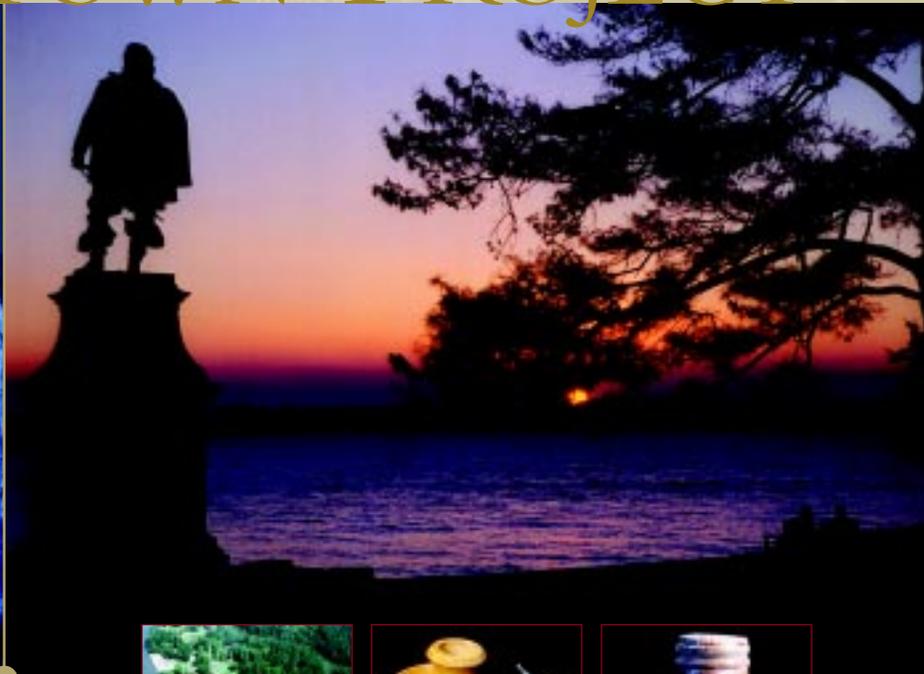


THE JAMESTOWN PROJECT



JAMESTOWN, VIRGINIA



National Park Service
Colonial National Historical Park, Jamestown Unit

Association for the Preservation of Virginia Antiquities
Jamestown National Historic Site

Volume 2
Chapters 4-5, References

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4 Environmental Consequences

4.1 INTRODUCTION

The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. However, the laws do give the National Park Service (NPS) the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of the park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given NPS the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that the NPS must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise.

Using a scientific and analytic basis for comparison, the following chapter describes the probable consequences of each proposed alternative on selected resources. Potential impacts are described in terms of type (direct, indirect, or cumulative; beneficial or adverse), context (site-specific, local, or regional), duration (short-term or long-term), and level of intensity (negligible, minor, moderate, or major). Because level of intensity definitions vary by impact topic, they are described specifically under each topic. On the other hand, the following general definitions are used throughout this chapter when assessing impacts:

Direct Impacts: Impacts that are caused by an action and occur at the same time and place.

Indirect Impacts: Impacts that are caused by an action but are later in time or farther removed in distance, but still reasonably foreseeable.

Cumulative Impacts: Impacts which result when the impact of the proposed action is added to impacts of other past, present, and reasonably foreseeable future actions, regardless of who undertakes the action (federal or non-federal agencies, organizations, or individuals).

Beneficial Impacts: Actions that result in a positive change in the condition or appearance of the resource, or a change that moves the resource toward a desired condition.

Adverse Impacts: Actions that results in a change that moves the resource away from a desired condition or detracts from its appearance or condition.

Site-specific Context: The impact would affect the Jamestown Project site.

Local Context: The impact would affect the Jamestown area.

Regional Context: The impact would affect localities, cities, or towns surrounding the park.

Short-term Impacts: Impacts that occur only during construction or last less than one year.

Long-term Impacts: Impacts that last longer than one year.

Impairment: Impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including opportunities that otherwise would be present for the enjoyment of those resources and values. An impact would be more likely to constitute an impairment to the extent it affects a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- Identified as a goal in the park's general management plan or other relevant NPS planning documents.

Impairment may result not only from NPS activities in managing the park, but also visitor activities, or activities undertaken by concessionaires, contractors, and others operating in the park.

To enable cross-referencing, the individual impact topics appear in the order in which they were discussed in "Chapter 3: Affected Environment." Cumulative impacts are summarized at the end of each resource topic, and a determination of potential impairment is made in the "Conclusions" section of each resource topic. Following a description of the impacts, a discussion of long-term management and sustainability of each alternative is presented.

Overall, the NPS based these impact analyses and conclusions on the review of existing literature and studies, information provided by experts within the park and other agencies, professional judgments and park staff insights, and public input. A summary matrix comparing impacts by alternative is provided at the end of "Chapter 2: Alternatives."

4.2 IMPACTS TO PARTNERSHIPS

One of the goals of the Jamestown Project is to foster partnerships related to the management of Jamestown Island, particularly the partnership between the Association for the Preservation of Virginia Antiquities (APVA) and the National Park Service. The APVA and NPS have jointly managed Jamestown Island since the 1930s. A Memorandum of Agreement that sets basic operating principles for the Island has been in effect since 1956 (Appendix A). Continual communication between the APVA and NPS fosters mutual understanding and support, and weekly staff meetings coordinate various events, products, and procedures.

The joint mission of the APVA/NPS partnership on Jamestown Island can be summarized in four phrases:

- Preserve both cultural and natural resources;
- Provide superb visitor experiences—a continuum from the most fleeting overviews to the most intensive long-term research;
- Research Jamestown's resources and early contact/colonial context, archaeologically, historically, and scientifically; and
- Educate visitors.

These two very distinct organizations bring different but complementary approaches and attitudes to the preservation, research, and interpretation of Jamestown, its resources, and its larger historical context. With this revitalization, there is an opportunity to build this partnership further and to ensure that the strengths of each organization are best applied to the common enterprise. Having common spaces, shared facilities, and complementary programs fosters the partnership, provides better resource protection, research and education capabilities, and improves visitor experiences. While the APVA/NPS partnership is certainly the most important at Jamestown Island, it

is not the only partnership that would be affected by the proposed revitalization. Appendix E provides a list of existing APVA/NPS Jamestown partnerships.

4.2.1 Methodology

The impacts on partnerships from each of the alternatives are impossible to fully quantify; however, the relative intensities of the effects can be assessed. The thresholds for evaluation are as follows:

Negligible: Negligible impacts would result from actions that have practically no change in partnerships related to the management of Jamestown Island.

Minor: Minor impacts would result from actions with relatively minimal effects. The action would affect only a small portion of the existing partnerships. The consequences of the action would not be readily apparent, and there would be no potential for new partners.

Moderate: Moderate impacts would result from actions that would noticeably affect (beneficially or adversely) one or a few partners or could result in the formation of one or a few new partners.

Major: An action that would beneficially or adversely impact several partnerships, or could result in the formation of several new partnerships.

4.2.2 Effects of Alternative A (No Action)

APVA and NPS. The APVA and NPS would continue to partner programmatically and in planning, fundraising for, and participating in various activities. However, the APVA and NPS portions of the Jamestown collection, curation, and research facilities would remain separated: the APVA collections at the Jamestown Rediscovery™ Center and the NPS collections in the basement of

the 1956 Visitor Center. Severe constraints on common space would force the organizations to continue taking turns using facilities for many activities. For example, the APVA and NPS would compete to schedule programs for staff, schools, volunteers, and researchers in Theatre II of the existing Visitor Center, and Theatre II would be so heavily scheduled that programs could be canceled for lack of space or moved to the Visitor Center lobby. Because summer months at Jamestown Island can be uncomfortable (heat, humidity, insects), indoor space must be available year-round. Additionally, under Alternative A, neither the NPS nor the APVA would qualify for American Association of Museums accreditation for collection storage conditions.

Jamestown Settlement and Colonial Williamsburg. Jamestown Settlement (living history museum owned and operated by the Jamestown-Yorktown Foundation) and Jamestown Island would continue to operate independently and without formal coordination. There would be no physical link between the two sites, and visitors would remain confused as to the differences between the sites before arriving. As no formal partnership currently exists and would not be created under this alternative, the effects of this alternative would be negligible to Jamestown Settlement; however, an adverse, major impact would result from opportunities missed as a result of not implementing one of the action alternatives.

Both the APVA and NPS would continue to work independently with Colonial Williamsburg on a number of research projects. Minor beneficial impacts would result from continued coordination; however, the impact relative to missed opportunities that would be provided by the action alternatives would be major and adverse.

Other Major Institutions. The APVA has partnered with a variety of educational and museum institutions to further its research program, including the University of Virginia and the College

of William & Mary. In addition, the NPS has cooperative agreements with the College of William & Mary and the Colonial Williamsburg Foundation for research and student support. Under the No Action Alternative, cooperation between these institutions and the APVA and NPS would continue, and the sustained sharing of research, resources, and data would benefit all involved. However, because the APVA and NPS collections would remain separate, enhanced research opportunities would be foregone. Minor beneficial impacts would result to partners as a result of continued cooperative research efforts.

Eastern National. Eastern National would continue under its cooperative agreements to run the Visitor Center gift shop for the APVA, as well as the Glasshouse demonstration and gift shop for the NPS. Impacts to the relationship with Eastern National would be negligible.

4.2.3 Impacts Common to the Action Alternatives

APVA and NPS. The action alternatives would all expand, though to varying degrees, common facilities and research opportunities, increasing the ability of the partners to cooperate and jointly sponsor activities. All action alternatives would include a Visitor Center/educational facility and upgrading the electronic infrastructure to allow better communications. The Observation Building would allow artifacts from both the APVA and NPS collections and the fortscapes/townscapes to be viewed in a single location. The Ludwell archaeology exhibit and the Agricultural exhibit would also enhance the partnership through a shared interpretive experience that links different resources and interpretive themes together, improving the ability to tell the complete story of Jamestown Island.

Jamestown Settlement and Colonial Williamsburg. The APVA and NPS would continue to seek ways to partner with the Jamestown-Yorktown Foundation

(owners and operators of Jamestown Settlement). Specifically, the APVA and NPS would continue to seek joint tickets and joint transportation systems so that visitors could access both places easily. In addition, the APVA and NPS would explore joint programming and marketing with Jamestown Settlement.

Other Major Institutions. The Agricultural exhibit area and the Ludwell exhibit facility would offer partnering opportunities with academic institutions to develop and create interpretive displays, as well as to complete archaeological excavations. In addition, monitoring of the impaired Powhatan Creek watershed, particularly the influence of new development within and outside Colonial National Historical Park (Colonial NHP), would be key in each of the alternatives and would offer the opportunity to strengthen partnerships with the Virginia Institute of Marine Science (VIMS) as well as several government agencies including the Virginia Department of Environmental Quality (VDEQ), Virginia Department of Conservation and Recreation (VDCR), Virginia Department of Game and Inland Fisheries (VDGIF), U.S. Environmental Protection Agency (EPA), and the U.S. Fish and Wildlife Service (FWS).

Eastern National. All of the action alternatives would include retail space in the Visitor Center, offering the continued opportunity for the APVA and NPS to strengthen the existing partnership with Eastern National. Additionally, Eastern National, and in turn the APVA and NPS, would benefit from expected increases in public understanding of the site.

Potential for New Partners. Each of the alternatives would offer the opportunity for the APVA and NPS to partner with a concessionaire to provide food and beverages at several locations at Jamestown. Partnerships could also be sought with bus companies to provide alternative transportation within Jamestown Island and to surrounding sites, though this would be most heavily used in Alternatives B and C.

Each of the action alternatives would incorporate new interpretive themes into the program at Jamestown, opening the door to partner with a number of new groups to develop and further expand these opportunities. These include the United Indians of Virginia, the Council of Virginia Indians, the National Association for the Advancement of Colored People (NAACP), the National Parks Conservation Association, and many more.

4.2.4 Effects of Alternative B

APVA and NPS. Featured artifacts would be displayed at the Observation Building and/or Ludwell facility so that they can be seen in context of the 1607 James Fort Site and Townsite, and objects related to the archaeological research process would be kept at the Ludwell site. Research and collections would be concentrated at the enlarged Jamestown Rediscovery™ Center, along with curatorial processing. This would encourage the APVA and NPS curators to work closely together and would promote more efficient procedures, thereby benefiting both organizations and strengthening joint research efforts, a moderate, beneficial, and long-term effect of the alternative.

This alternative would also provide additional and more flexible common space at the replacement Visitor Center on the Island to allow for more public presentations, school programs, and special events. Classrooms there could be used by either partner or could be used jointly, but the emphasis would be on sharing research, teaching, and interpretation. These improvements would result in a major, beneficial impact to the partnership.

Jamestown Settlement and Colonial Williamsburg. Construction of the Intermodal Transportation Terminal on Neck of Land would offer a single information center for visitors traveling along the Colonial Parkway. The new facility would orient visitors to the Jamestown regional context, its history, the Chesapeake Bay, and their options, as

well as serve as an introduction to Jamestown Island, Green Spring Plantation, and Jamestown Settlement, clarifying for visitors the differences between all attractions.

Physical connections between the Island and the Settlement would improve the partnership as well. The addition of boat docks and multimodal transfer points at Powhatan Creek Overlook and Neck of Land would improve visitors' ability to reach both Jamestown Island and Jamestown Settlement. Such connections would enhance the partnership between the two Jamestowns by facilitating the "sharing" of visitors. The hike/bike trail connection between the Glasshouse area and Jamestown Settlement would also provide shared visitor access. The impact on the partnership would be major and beneficial.

Buses to and from Colonial Williamsburg would offer the opportunity to tell a more complete story of the history of colonial Virginia during a narrated ride, as well as to enhance the partnerships between the APVA, NPS, and Colonial Williamsburg. In addition, these buses would be coordinated with boats within the Jamestown Project area to create an integrated multimodal transportation system that conveniently shuttles visitors within Jamestown and to partnering attractions, a major, beneficial impact to partnerships.

Other Major Institutions. Proposed improvements to Jamestown Island are expected to result in increases in visitation, and more funding would be available for monitoring and studies within Jamestown, including ground and surface water quality monitoring, rare and endangered species monitoring, and archaeological investigations. In addition, proposed construction of a trail across the marsh on Neck of Land and increased boat traffic on Back River would pass near a bald eagle nest and create a need for increased monitoring of the nest. These efforts would in turn create opportunities for relationships with university and government agency partners.

For example: partnerships with the Center for Conservation Biology at the College of William & Mary and the University of Maryland would benefit from increased monitoring of plants and animals throughout the park, including the endangered sensitive joint-vetch population; VIMS would benefit from increased monitoring of ground and surface waters and wetlands; and the Virginia Marine Resources Commission (VMRC) and FWS could partner with the APVA and NPS on a long-term study of boat traffic and bald eagle interaction. Impacts to institutional partners would be long-term, beneficial, and major.

Eastern National. The greatest diversity in visitation would result from implementation of Alternative B through its focused educational and research programs. Additionally, construction of a replacement Visitor Center on the Island would house Eastern National's gift shop, and this shop, along with the Glasshouse operations, would benefit from increased patronage. Impacts to Eastern National would be long-term, beneficial, and major.

Potential for New Partners. A number of opportunities would exist for partnering with vendors and concessionaires in Alternative B. This alternative would include both a boat concessionaire for water-based transport around Jamestown Island and a bicycle concessionaire for bicycle rentals, which would be self-supporting and preferably, income-producing. Also, independent food and drink vendors would provide refreshments at several locations at Jamestown.

Members of the Virginia Indian community have expressed enthusiasm for an interpretive trail across the marsh at Neck of Land. They see such a trail as a place for interpreting natural resources and for sharing Virginia Indian experiences and perspectives with visitors en route to Jamestown Island. They have also particularly supported the proposed system of boat links, as it would be an excellent venue for interpreting the centrality of rivers and water in their cultures and societies.

Interpretive partnership opportunities would also be explored with the United Indians of Virginia and the Council of Virginia Indians. Likewise, this alternative would present opportunities for partnerships with African-American and other nationality groups in attempting to tell the story of Jamestown from multiple perspectives. This would be a beneficial, major impact to partnerships.

In addition, this alternative would offer the opportunity to seek out technology partners, perhaps to implement monitoring of bald eagle nests by live-linked Internet cameras.

4.2.5 Effects of Alternative C

APVA and NPS. Alternative C would separate the Jamestown collection, keeping the APVA collection at the Jamestown Rediscovery™ Center and removing the NPS collection to a new Neck of Land facility. Collection processing and research would also be separated. As such, objects would need to be moved from one site to the other to be studied, involving operational, security, and preservation issues, or researchers would be forced to travel from one building to the other to complete their work. This would not only decrease a researcher's ability to compare artifacts, but it would also increase the challenge of seeing the history of Jamestown holistically. Having the collections and their accompanying curation and research facilities separated would create a long-term, adverse, but minor effect on the APVA and NPS partnership.

Alternative C would also separate classroom space from APVA collections, decreasing educational potential and partnership efficacy. Locating the collections and their accompanying activities in two different places may be confusing to researchers and educators and may send the message that the APVA and NPS partnership is less than a full fledged one.

Jamestown Settlement and Colonial Williamsburg.

As in Alternative B, an Intermodal Transportation Terminal at Neck of Land would provide an overview of the area to visitors arriving by way of the Colonial Parkway and better distinguish between Jamestown Island and Jamestown Settlement. Also similar to Alternative B, the three boat dock approach in Alternative C would improve visitor access between the two sites. As there would be no separate and distinct bike/hike lane on the Colonial Parkway, visitors would have to use alternate means of traveling between the Settlement and the Island.

Impacts to the partnership with Colonial Williamsburg would be the same as those described under Alternative B.

Other Major Institutions. There would be a need to monitor general resources including ground and surface water quality and plant and animal populations, as well as more specific problems such as bald eagle response to increased boat traffic. This need, however, would not be as great as in Alternative B. The effect would be long-term, beneficial, and major, as university and state agency partners would be called on to complete these studies, thereby benefiting from research opportunities, grant money, and recognition.

Eastern National. Alternative C would provide retail space for Eastern National's shop at the replacement Visitor Center on Neck of Land. This, combined with an expected increase in visitation, would be moderately beneficial to Eastern National and to the APVA/NPS/Eastern National partnership.

Potential for New Partnerships. As in Alternative B, food and drink vendors would provide refreshments at various locations. A boat concessionaire would run the water transport around Jamestown Island, and an independent concessionaire would provide bicycles. These actions would result in major, beneficial impacts on the potential for new partners.

4.2.6 Effects of Alternative D

APVA and NPS. In place of development on Neck of Land, Alternative D would substantially enlarge the existing 1956 Visitor Center and move the NPS collections from the building's basement to another floor. However, the Jamestown collection would remain separated because the APVA's portion would remain at the Jamestown Rediscovery™ Center, therefore straining the APVA/NPS partnership by sending staff and researchers to two different locations. APVA research would also remain at the Jamestown Rediscovery™ Center, while curation, study, and display of the collection would continue to take place at the Dale House. Such an effect would be a long-term, minor, adverse impact of the alternative.

Jamestown Settlement and Colonial Williamsburg. Alternative D does not include any boat connections; therefore the only improvement to the current connection to Jamestown Settlement would be by means of the bike/hike trail, which would connect the Glasshouse area with the Jamestown Settlement. This trail would constitute a minor beneficial impact toward the partnership; however, because there would be no formal orientation facility, visitors would remain confused between the two Jamestowns and continue to see them as competing units.

Impacts to the partnership with Colonial Williamsburg would be the same as those described under Alternative B.

Other Major Institutions. The collections and their curation/research would remain separated under this alternative. In addition, Alternative D would offer little opportunity for increased research programs, and beneficial impacts to existing institutional partners would be minor.

Potential for New Partnerships. Given the expected space needs for the Visitor Center under this Alternative, retail and food opportunities would be limited, as would income generation from them.

Alternative D also makes no provision for a boat service in the multimodal plan, a missed opportunity for a new partnership.

4.2.7 Effects of Alternative E

APVA and NPS. Alternative E would keep the APVA collections at the Jamestown Rediscovery™ Center but would remove the NPS collections to a remote location. This would not enhance the APVA/NPS partnership, nor would it be convenient for researchers, as the collections would be physically separated by some distance. Moderate, long-term, adverse impacts to the partnership would result.

Jamestown Settlement and Colonial Williamsburg. Similar to Alternative B, the new Intermodal Transportation Terminal at Neck of Land would serve as a gateway and would suggest destination and transport options to visitors arriving along the Colonial Parkway. The facility would provide an introduction to the area, as well as to both Jamestown Island and Jamestown Settlement.

Alternative E would have a two-stop boat transport system, which would stop at Neck of Land and Jamestown Island but not near Jamestown Settlement. However, the hike/bike trail would cross the Neck of Land marsh going west to Powhatan Creek Overlook, near the Jamestown Settlement, thus allowing visitors to hike/bike between Jamestown Settlement and Neck of Land. An additional hike/bike trail would also provide access between the Glasshouse area and the Settlement. The Intermodal Transportation Terminal, along with improved access between the sites, would result in moderate, long-term, positive impacts to a potential partnership.

Impacts to the partnership with Colonial Williamsburg would be the same as those described under Alternative B.

Other Major Institutions. This alternative has both beneficial and adverse effects on partnerships with other institutions. Having divided collections and classroom space both on and off Jamestown Island would complicate the APVA/NPS partnership with other institutions by increasing distances, risking greater confusion, and removing the NPS collections further from their original origins. Disconnecting the collections from the major classroom space on the Island would separate learning places from the Island, the major resource. It would decrease the ability to partner and the value of the experience. The hike/bike trail that follows Neck of Land to a marsh observation platform and continues east as a boardwalk over the marsh would allow for partnerships in research, education and interpretation of the natural resources located there. Because this alternative has the potential to affect multiple partners, the impacts would be considered moderate and beneficial.

Potential for New Partners. Two boat docks would serve as multimodal transfer points. The APVA and NPS would have the opportunity to partner with a boat concessionaire to provide the boat transport service. Additionally, vending and refreshments would be provided throughout the Island, requiring a new partner.

4.2.8 Cumulative Impacts

Cumulative impacts to partnerships would result from ongoing monitoring, research, and visitor activities at Jamestown Settlement, other historical areas in the region, institutions, and within Colonial NHP. Benefits would accrue to biological, cultural, and archaeological research, as well as to interpretive quality and visitor experience. Combined with the beneficial and adverse impacts to partnerships from each of the action alternatives, cumulative impacts to partnerships in general would be beneficial, long-term, and major. Under the No Action Alternative (Alternative A), cumulative impacts would be minor, long-term, and beneficial.

4.2.9 Conclusion

Although Alternative B proposes the most construction, it offers the greatest number of venues to visitors and has the most benefits to partnerships. Alternative D includes the least construction, but also offers the fewest venues for visitors. In this alternative, there would be fewer benefits to partners and minimal opportunities to form new partnerships. Alternatives C and E both would strengthen partnerships with major institutional and agency partners through new research ventures; however, the APVA/NPS partnership would be strained in these alternatives by separated collections, research areas, and common spaces. In addition to offering the greatest benefits to other partners, Alternative B would seek to strengthen the APVA/NPS partnership by combining collections, research, and curatorial facilities in an expanded Jamestown Rediscovery™ Center. Additionally, Alternative B, as well as Alternatives C and E,

would provide an Intermodal Transportation Terminal at Neck of Land that would help to introduce visitors to the area and to both Jamestown Island and Jamestown Settlement.

Table 4-1 summarizes the impacts to partnerships from each of the alternatives. Overall, impacts from the No Action Alternative (Alternative A) would be moderate, long-term, and adverse. For Alternative B, overall impacts would be major, long-term and beneficial. While under Alternatives C and E, total impacts would be long-term, moderate, and beneficial, Alternative D would provide minor, long-term, beneficial impacts to partnerships.

In none of the proposed alternatives would there be a detrimental impact to any of the partners. In many instances, however, there would be beneficial impacts of each of the alternatives to many of the partners.

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
APVA and NPS	Minor, long-term, adverse	Moderate, long-term, beneficial	Minor, long-term, adverse	Minor, long-term, adverse	Moderate, long-term, adverse
Jamestown Settlement	Major, adverse	Major, long-term, beneficial	Major, long-term, beneficial	Minor, long-term, beneficial	Moderate, long-term, beneficial
Colonial Williamsburg	Major, adverse	Major, long-term, beneficial	Moderate, long-term, beneficial	Moderate, long-term, beneficial	Moderate, long-term, beneficial
Other Major Institutions	Minor, beneficial	Major, long-term, beneficial	Major, long-term, beneficial	Minor, beneficial	Moderate, long-term, beneficial and adverse
Eastern National	Negligible	Major, long-term, beneficial	Moderate, long-term, beneficial	Minor, beneficial	Moderate, long-term, beneficial
Potential for New Partners	Major, adverse	Major, long-term, beneficial	Major, long-term, beneficial	Negligible	Moderate, long-term, beneficial
Overall Impact	Moderate, long-term, adverse	Major, long-term, adverse	Moderate, long-term, beneficial	Minor, long-term, beneficial	Moderate, long-term, beneficial

4.3 IMPACTS TO RESOURCES AND ENVIRONMENT

The following section presents impacts related to cultural, physical, natural, and socioeconomic resources.

4.3.1 Impacts to Cultural Resources

The primary mission of the NPS, as it is described in the Organic Act of 1916, is to preserve and protect natural and cultural resources of the United States. In order to meet this mission, NPS must first identify and evaluate the significance of these resources. The National Historic Preservation Act (NHPA) of 1966, as amended, provides the legal framework for evaluating sites and properties of state, local, and national significance. It established the National Register of Historic Places (NRHP), which is the official national list of inventoried, historically significant properties. Section 110 of the NHPA requires government agencies to inventory all of their historic properties and evaluate them according to the criteria of the National Register. For sites to be included on the National Register, each must meet at least one of four major criteria:

- A. It must be associated with events that have made a significant contribution to the broad patterns of our history;
- B. It is associated with the lives of significant persons in the past;
- C. It embodies the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- D. That the site has yielded or may be likely to yield, information important in history or prehistory.

Section 106 of the NHPA also requires that all federal agencies must consider impacts to cultural and archaeological resources before implementing any federal action. Information for sites listed on the National Register includes the site's period of historic significance and its contributing and non-contributing features. This information, along with its inventory, provides enough detailed information about the site's resources to allow assessment of impacts of the various alternatives.

Management Policies 2001 (NPS 2000b) and *Director's Order 28: Cultural Resource Management* mandate that cultural landscapes, historic buildings, and archaeological resources be addressed as important to the National Park Service. As such, documentation and analysis of these resources are an important part of all NPS planning efforts and must therefore be addressed in this document. The evaluation of historical integrity and significance of these resources is done through historical research, field documentation, and evaluation criteria, as described in the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (NPS 1996b). Research findings from this process help people make educated management decisions for preservation, interpretation, and maintenance of significant features. This information also becomes valuable in satisfying compliance with Section 106 of the NHPA, which, as noted above, requires that federal agencies consider the effects of their proposals on historic properties and consult with the State Historic Preservation Officer (SHPO) and, as necessary, the Advisory Council on Historic Preservation (ACHP).

Within the Jamestown Project site, the Colonial Parkway, Colonial NHP- Jamestown Island, and the Jamestown National Historic Site (the APVA property) are all listed on the National Register. The Colonial Parkway meets National Register criterion A in the area of Conservation and Recreation as it relates to the developing ethic by the NPS to apply conservation and interpretation to historic resources, not just natural resources. Colonial NHP was the

first park to do so in the entire national park system in the 1930s. The Parkway also meets criterion C in the area of Landscape Architecture and Architecture because it is an intact example of 1930s parkway design, incorporating Colonial Revival style architecture into its drainage structures and bridges.

Documentation for the National Register describes the Parkway as having a high overall historical integrity because alterations and additions over the years have been minor and did not change the Parkway's original appearance. The Register establishes the period of significance to be 1930 to 1958, when the Parkway was completed. Although the Williamsburg to Jamestown section does not meet the fifty-year age consideration for inclusion in the Register, the entire Parkway was designed during the 1930s. This section of the Parkway is also included on the Register because it follows the design and construction of the earlier period, an example of early 20th century parkway design.

Jamestown Island meets all four criteria, and the draft National Register documentation establishes the period of significance ending in 2000 because on-going archaeological work at the APVA site is considered part of the historical association. Therefore all archaeological resources up to the year 2000 are important to consider in the impact assessment. The draft National Register documentation includes landscape features such as earthworks, roads, fortifications, and commemorative resources that relate to the site's primary periods of significance. The ACHP and the SHPO are currently reviewing this document.

There are two other important 20th century periods of activity that have shaped the designed landscapes of Jamestown Island and Glasshouse Point. Both periods are being currently evaluated to determine whether they are eligible for inclusion in the National Register for Jamestown. The first period extends through the Depression Era from 1935 through to the onset of World War II, when Civilian Conservation Corps (CCC) workers helped with erosion control projects and excavations of the

archaeological digs on the Island. The second period, known as Mission 66, had a dramatic and lasting impact on the development of the facilities at Jamestown. It is for this reason that the draft *Cultural Landscape Report* (CLR) (OCULUS 2002) has determined 1957 as the period of significance for the Mission 66 landscape of Jamestown Island and Glasshouse Point. Based on field inventories and documentation, this landscape period retains a high level of integrity as a whole. Mission 66 was a large-scale ten-year planning and construction campaign initiated by the NPS in the early 1950s. The major intent of Mission 66 was to bring the visitor directly to the resource. As a result, visitor centers like the one at Jamestown were placed adjacent to or on the significant resource. Tour roads were also important design components, accommodating vehicular access to remote sites.

NPS officials responded to the dramatic increase in park visitation during this time period by improving and expanding visitor services through modern facilities and improved interpretative programs. Stylistically and philosophically, it was a bold departure from the characteristic rustic style of park architecture. Mission 66 architects and landscape architects approached design using new technology, modern materials, and new structural forms. Interpretation of the resources was based on thorough scientific and historical documentation available at the time. As an example, the archaeological investigations and historical research helped determine the design and placement of the interpretive landscape features at New Towne.

The impact this period had on National Park development was substantial enough to initiate the NPS *Mission 66 Theme Study*. The first volume of the study addresses the development of the modern visitor center. Evaluation criteria based on the less than fifty-year threshold were established for buildings. The second phase of the theme study will address the importance of landscape design in park development. Because this document has not yet been completed, the context for Mission 66

landscape evaluation criteria is not available. However, NHPA and the National Environmental Policy Act (NEPA) require that evaluation of all resources be completed before assessing impacts. In order to make a determination of contributing resources listed in this document, a meeting was held on April 29, 2002, with the Washington Office Historical Landscape Architect (NPS), the Philadelphia Support Office Cultural Resources Manager (NPS), the Virginia State Historic Preservation Officer staff, Oculus staff, and Colonial NHP and APVA staff. A complete discussion of how the group reached consensus in evaluating this landscape is detailed in “Chapter 5: Consultation and Coordination.”

Assessing impacts to cultural resources under the Section 106 compliance regulations requires a determination of whether a proposed action falls under “no historic properties affected,” “no adverse effect,” or an “adverse effect,” where effect is defined as an action that could potentially alter the characteristics of a historic property or landscape. An action that alters the integrity of these characteristics but does not diminish the property’s significant historic features is considered a “no adverse effect.” An action that diminishes the integrity of those characteristics is considered to be an “adverse effect.” Examples of adverse effects on historic properties and landscapes include, but are not limited to: physical destruction or damage to all or part of the structure; alterations, including rehabilitation, restoration, stabilization, and maintenance that do not follow the *Secretary of Interior’s Standards and Guidelines for Archeology and Historic Preservation* (NPS 1983); removal of features to a new location; changing the type of use of the structure or its physical features within its setting that contribute to the historical significance; introduction of visual, audible, or atmospheric elements that diminish significant historic features; and neglect of features and property which causes deterioration. Effects that may occur later than, or away from the undertaking are also considered potential impacts of the action and are called indirect effects.

In order to satisfy the requirements of Section 106, a final determination of effect will be made in consultation with the Virginia SHPO (as represented by the Virginia Department of Historic Resources or VDHR). This will involve preparation of a Programmatic Agreement, which will be attached to the Record of Decision (ROD). If an adverse effect is found, the NPS and APVA would consult further with the SHPO and notify the ACHP. In addition, alternatives or modifications to the action would be developed to avoid, minimize, or mitigate adverse effects to the historical resources, and mitigation efforts will be identified for all alternatives, usually consisting of design considerations and guidelines to protect the integrity of the structures.

4.3.1.1 Ethnographic Resources

Based on the review of ethnographic resources at Jamestown, as discussed in “Chapter 3: Affected Environment,” four “traditionally associated” groups were identified: American Indians, African/African-Americans, descendants of previous inhabitants, and Jamestown Memorial Church parishioners. Overall, the proposed alternatives would not impact any identified traditional activities carried out by these groups, as previously discussed in Chapter 3. Therefore, there would be no adverse effect to ethnographic resources.

In addition, the special legal relationship pertaining to government-to-government consultations with American Indian tribes is outlined in an April 29, 1994, memorandum from the President to the heads of executive departments and agencies. In keeping with this mandate and the provisions of the NEPA, the APVA and NPS would consult with American Indian groups on planning and management activities that affect their historical connection with Jamestown. The APVA and NPS would develop and accomplish their programs in ways that reflect respect for the beliefs, traditions, and other cultural values of the tribes with ancestral ties to Jamestown. Consultation with these groups would continue in the future, helping to improve understanding and

achieve common goals during the implementation of this *Development Concept Plan / Environmental Impact Statement* (DCP/EIS).

Because of Jamestown's long human history and known association with nearby tribal communities, some minimal potential for discovery of human remains and associated items of cultural patrimony exists. The Native American Graves Protection and Repatriation Act (NAGPRA) addresses the rights of tribes and the consultation procedures regarding certain human remains and affiliated cultural items. To comply with the provisions of the act and its implementing regulations (43 CFR 10), APVA and NPS managers would establish a prompt and effective notification system to consult with concerned groups regarding discovery of human remains and associated objects. Managers would deal with such burials on a case-by-case basis with informed awareness of tribal concerns. Burials and associated objects would be afforded the greatest respect, and the APVA and NPS would consult with the relevant tribes regarding remains. A NAGPRA implementation plan would be developed to include strategies for discussing archaeological investigations and inadvertent discoveries with the Virginia Council of Indians and the United Indians of Virginia.

4.3.1.2 Archaeological Sites

As noted above, Colonial NHP and the Jamestown National Historic Site are already listed on the National Register due to their designation as historical sites. Documentation for the NRHP on both portions of Jamestown is currently in draft form (McCartney 2001) and is being reviewed by the SHPO and the ACHP. It identifies the archaeological sites that have been evaluated as significant or that would require additional study to determine their level of significance.

The Jamestown Project site contains extensive archaeological resources. The general locations and conditions of those resources were discussed in "Chapter 3: Affected Environment." At least six

archaeological sites are present at Neck of Land, Glasshouse Point, and Powhatan Creek Overlook, while Jamestown Island holds even more numerous and more densely packed sites. On the NPS property, New Towne is the largest and most noteworthy of these archaeological sites, but at least 60 other sites are situated elsewhere on the Island, containing traces of human activity on Jamestown Island over the last 12,000 years.

The APVA property (Old Towne) constitutes 22.5 acres of Jamestown Island, surrounded by the James River and NPS property. A primary goal of the APVA is to protect significant archaeological remains by carefully monitored grounds work, research, and pre-construction excavations. (The APVA was founded in 1889 to save Jamestown from further James River erosion, plowing, and vandalism.) The APVA considers all of Jamestown Island as an archaeological site, given its legislatively defined bounds in the 17th century and the very limited uplands suited for settlement. Thus, any proposed actions or undertakings on Jamestown Island would potentially impact archaeological resources to some degree.

Methodology

The methodology used for assessing the impact on archaeological resources within the Jamestown Project site is primarily based on documentation that includes: *Jamestown Archaeological Assessment, 1992-1996, Volumes 1-8*; *2001 Phase II Archaeological Assessment of the Neck of Land Property*; *Archaeological Evaluation of Site 44JC931, Proposed Visitor Center Project Area, Jamestown Island*; *2000 Archaeological Survey of the Glasshouse Point Area near Jamestown Island*; National Register Bulletin 16A: "Guidelines for Completing National Register of Historic Place Forms;" National Register Bulletin: "Guidelines for Evaluating and Registering Archeological Properties;" National Register Bulletin 15: "How to Apply the National Register Criteria for Evaluation;" and consultation with the Virginia SHPO.

These archaeological inventories reliably predict the location of resources. The inventory and assessment information implies that the likelihood of impacting archaeological resources during the implementation of any action described in the alternatives is relatively high, as actual and potential component sites and their assemblages of archaeological data are scattered throughout the Jamestown Project site.

The various action alternatives proposed for the Jamestown Project would affect archaeological resources in different ways and to varying degrees. This section specifies these potential impacts and suggests mitigating actions to diminish adverse impacts and avoid most irreversible or irretrievable impacts to the archaeological resources. The impact analysis is based on proposed development and construction, but not on potential effects of the interpretive plans, which are currently unknown.

All alternatives have carefully attempted to avoid the archaeological sites to the fullest extent possible given the complicated constraints posed by the natural and cultural environment at Jamestown. On April 18, 2002, the alternatives were presented to the SHPO's staff archaeologist. It was her opinion that the extensive archaeological surveys already completed by the APVA and NPS satisfied their requirements. Disturbance of unanticipated discoveries located during construction would be mitigated in accordance with Secretary of the Interior Standards. Interpretive exhibits on the known archaeological resources disturbed during construction would be considered as part of the mitigation process.

For the purposes of analyzing impacts to archaeological resources, the intensity of the impact is based on the potential of the site to yield information important in prehistory or history, as well as the probable historic context of the affected site:

Negligible: The impact is at the lowest level of detection and is barely measurable with no perceptible consequences to known archaeological resources.

Minor: The impact affects a known archaeological site with little or no potential to yield information important to prehistory or history. These archaeological resources are generally ineligible to be listed on the National Register.

Moderate: The impact affects a known archaeological site with the potential to yield information important to prehistory or history. The historic context of the affected site would be local or state.

Major: The impact affects a known archaeological site with the potential to yield important information about human history or prehistory. The historic context of the affected site would be national.

Effects of Alternative A (No Action)

In Alternative A, the No Action Alternative, current buildings remain with future programming, research, archaeological investigation, cultural landscape investigation, and maintenance operations as planned for both the APVA and the NPS and their joint management goals. This alternative would allow for any necessary management and operations for the existing facilities over time, and would include prudent management and operations for 2007, its associated events, and for the years beyond 2007.

Archaeological digs and research would continue on both properties, as APVA and NPS each follow their goals and objectives for archaeological research and interpretation. This continued action would result in negligible impact to Jamestown Island's archaeological resources. However, interpretation would remain separate, with separate exhibits and methods of interpretation unique to each organization.

Impacts Common to the Action Alternatives

Alternatives B, C, D, and E share several common features that would potentially impact archaeological sites. In addition to the specific

actions listed below, potential adverse, indirect and direct impacts from increased visitation would also occur. Increased visitation would result in more visitors accessing archaeological sites. Also, the addition of facilities near sensitive archaeological sites would also allow for increased access. Open excavations used for interpretation would be more susceptible to wear and tear or vandalism, if not properly protected or supervised. However, enhancing the interpretive and educational components of the visitor experience would increase public sensitivity to the importance of the resources and thus limit degradation. Provision of controlled access, fences or other barriers, and other means to protect archaeological sites would keep visitors from directly contacting the resource. This in turn would reduce damage and loss from compaction and erosion of surrounding soils.

Expanded Parking Lot at the Jamestown Rediscovery™ Center

The existing Jamestown Rediscovery™ Center parking lot would be expanded in all of the alternatives. The Jamestown Rediscovery™ Center environs have been tested at various times and contain scattered 17th and possibly 18th century occupation (Outlaw 2001). Nonetheless, pre-construction archaeological excavations in the 1990s to permit the building of the Jamestown Rediscovery™ Center, a major addition to the north side of the Yeardley House, yielded predominantly negative results in the general area currently proposed for expansion of the parking lot. The expansion would be on fill, in previously disturbed areas, with no below ground disturbance. Therefore, there would be no impact to the archaeological resources.

Pedestrian Bridge to the Observation Building

The proposed pedestrian footbridge to the Observation Building and existing 1907 monument would be constructed across the Pitch and Tar Swamp on the western side of the existing Visitor Center. The bridge alignment would have a slight bend near its center but generally proceeds directly

to the Observation Building with the 1907 monument as a visual target. The footbridge would have weathering steel or pre-cast concrete spans of 50 feet, thereby limiting impacts on the Pitch and Tar Swamp area or any unknown archaeological site. The piers would rest on pile caps supported by subsurface piles.

The bridge alignment avoids major archaeological sites and major trees. The southern terminus of the bridge would be sited in an area extensively excavated by the NPS from 1934-41, and the footbridge would completely avoid the Great Road trace, which is located further west. Data recovery before construction would be required in the very limited unexcavated areas that would be impacted by the bridge. Construction access mats would be carefully placed to provide temporary access to the construction sites. The limited area of no excavation, data recovery in unexcavated areas, and sensitive construction techniques would mitigate any impacts to archaeological resources, diminishing adverse impacts from this action to negligible.

Ludwell Exhibit Facility

The Ludwell exhibit facility would be located to the northwest of the Ludwell Statehouse Group foundations and burial site. The Ludwell Statehouse and its surrounding environs have been extensively investigated since 1901, and these areas are currently under exploration by the APVA. Significant portions of the site have been completely excavated, while some sections remain intact. The site proposed for the Ludwell exhibit facility would be fully excavated by APVA archaeologists in advance of construction.

The proposed structure would lie lightly on the land and avoid the traditional subsurface excavation for footings. New methods and techniques for footing construction would be employed. A series of bearing pads would be placed at points where the ground is deemed clean of artifacts. There would be some bearing pads placed above existing grades, which may have archaeological strata below. Bearing pads at these locations would be constructed upon layers

of sand, filter cloth, and gravel. The bearing pads could be easily shifted to a new location to allow for future archaeological excavation at that spot. The bearing pads would support the load of a lightweight linear pre-fabricated truss wall that would have the ability of spanning significant archaeological areas below. Corkscrew-type tie down anchors installed at “clean spots” using short tension rods would secure the structure for the uplift stresses brought on by severe wind loads. This proposed structure is intended to serve the purposes of interpretation and exhibit and would have minimal penetration, be simple in texture and scale, and would blend into the newly buffered landscape as a “non building.” Therefore, there would be no adverse impacts to archaeological resources at this site.

Agricultural Exhibit Area

The Agricultural exhibit area would be located somewhere within the four-acre open meadow situated immediately east of the New Towne walking loop. The NPS archaeologist commenced a systematic survey of the meadow in June 2001, and the preliminary results showed the presence of 17th, 18th, and 20th century occupation. Survey data also indicated that an area in the southwest corner of the meadow is void of archaeological materials. This zone appears to be the optimal place within the meadow to develop the Agricultural exhibit and restroom facilities. Therefore, there would be no adverse impact to archaeological resources by this action.

Ambler House Ruins

An observation platform at the second level of the Ambler House is proposed in all the action alternatives. The viewing platform would be constructed as an independent structure system within the ruin and would only contact the original walls for protection purposes. The structural system would be designed to allow for archaeology to take place on the ground level at a later date. Impacts to the archaeological site would be limited to where support columns are placed. Archaeological testing

and data recovery would occur prior to construction. There would be a minor impact to the archaeological site, as its significance under Criterion D would not be impacted.

Townsite Landscape

The Townsite landscape may change with implementation of the Interpretive Plan for Jamestown (currently in development). New ideas for interpretation of the Townsite are being considered, but no final decisions have been made. A goal of any new interpretation features or changes within the Townsite is to keep them above ground, thereby not impacting archaeological resources. None of the alternatives in this document present interpretive plans for the Townsite.

Hike/Bicycle Path from Glasshouse Point to Jamestown Settlement

The hike/bicycle path from Glasshouse Point to Jamestown Settlement would be constructed on fill, above grade, in order to eliminate ground disturbance. There would be a negligible impact to archaeological site 44JC986, an undated prehistoric American Indian lithic scatter. This site has been deemed eligible for the National Register of Historic Places under Criterion D (the potential to yield important information). Also, the path alignment could potentially be on the Greate Road trace. This would provide new interpretive opportunities along the historic trace, while preserving the original alignment. No adverse impacts would be expected to the road trace.

Reconfigured Parking Lot at Glasshouse Point

As noted above, Glasshouse Point contains site 44JC986, an undated prehistoric American Indian lithic scatter. The reconfigured parking lot at Glasshouse Point would avoid the positive test units within the area, and construction would be within an approximate 30 to 50 foot band adjacent to the current parking area, where the test units were negative. Therefore, there would be no adverse impacts to the archaeological site.

Effects of Alternative B

In addition to the items listed under “Impacts Common to the Action Alternatives,” Alternative B proposes ground-disturbing activities at Neck of Land, Glasshouse Point, and Jamestown Island. These development actions are planned near archaeological sites on both APVA and NPS property and would require careful design and monitoring in order to protect these resources.

Neck of Land

Alternative B proposes new development at Neck of Land, intended to function as a gateway to both Jamestown Island and Jamestown Settlement. This new development would include an Intermodal Transportation Terminal, a parking lot, a hike/bicycle path, and a boat dock on Back River. The proposed plan for these facilities would be a potentially major impact to three archaeological sites previously located and partially tested on Neck of Land by the NPS. These sites are 44JC1047, 44JC1048, and 44JC1049 (Butts et al. 2001). Sites 44JC1047 and 44JC1048 are historic-period domestic sites containing buried, intact foundations. Site 44JC1049 is a prehistoric American Indian site, largely comprised of lithic debitage in the plow zone. During preliminary design, these sites have been avoided entirely. In addition, the surfacing material for the parking lot would be placed atop the present day ground surface, similar to the hike/bicycle path. The perimeter of all three archaeological sites would be marked by snow fencing and would appear on all construction documents. The NPS archaeologist would continually monitor any groundbreaking activity near these sites to ensure protection.

Glasshouse Point

Alternative B proposes three boat docks, one along the Powhatan Creek shoreline at the base of the Powhatan Creek Overlook. This new boat dock would be built to enable water transport from Neck of Land to the Powhatan Creek Overlook (and subsequently the Glasshouse area and Jamestown Settlement). Two archaeological sites, 44JC106 and 44JC1019 are located within this area. Site 44JC106 is

a multi-component site containing both prehistoric American Indian and 17th century English Colonial archaeological deposits. Both sites are deemed eligible for the National Register of Historic Places under Criterion D.

The proposed dock is located along the southeast edge of site 44JC106. There would be a potential minor adverse impact to this archaeological site due to dock construction at its edge. Construction plans for the dock would include pilings in Powhatan Creek, keeping the dock itself away from the archaeological site. The walkway from the dock to the Overlook and the crossing at the Colonial Parkway would traverse the two archaeological sites. In order to mitigate this potentially adverse minor impact, the walkway would be built on fill above grade, without cuts into the sensitive archaeological sites. The present day ground surface overlying these sites would be capped with fill to offer further protection, and in turn the fill would be graded and surfaced. Ground disturbance would therefore be minimal. The NPS archaeologist would monitor construction of the dock and the walkway. Also, to avoid impact to the archaeological sites, construction would initiate from the waterside to minimize any adverse impact. Monitoring and sensitive construction techniques would mitigate potential adverse impacts to the archaeological sites.

Jamestown Island

Hike/Bicycle Bridge, Boat Dock, and Path

Alternative B proposes a boat dock and the terminus of the hike/bicycle bridge across Back River along the north shore of the Island, just north of the Island parking lot. A hike/bicycle path would then lead south through the lot to the replacement Visitor Center. The dock, bridge terminus, and path would be constructed west of archaeological site 44JC928, a prehistoric and 17th–20th century site. This would avoid even minor impacts to this archaeological site; however, during construction, the NPS archaeologist would continually monitor the site to ensure protection.

Visitor Center

In Alternative B, the replacement Visitor Center is located in the existing Jamestown Island parking lot, and the parking lot is partially reconfigured to accommodate the new facility. Initially, the proposed Visitor Center was located east of the currently proposed site. During the planning process, this location was discovered to be of archaeological significance. The site, 44JC631, has remnants of early 17th century earthfast structures and would be preserved (Jones 2001). Subsequently, the location of the replacement Visitor Center was shifted to the east to avoid major impact to site 44JC631.

Shifting the location of the replacement Visitor Center would place the facility partially on site 44JC930, an occupation site exhibiting prehistoric as well as 17th, 19th (Civil War), and 20th century use. This would pose a potentially major impact; however, after the impacts of excavations in the 1930s and subsequent parking lot construction, no further work was recommended for 44JC930. Despite this technical recommendation from the archaeologist at the time, there is always the possibility of new discovery. Therefore, the NPS archaeologist would monitor the construction of the replacement Visitor Center closely to limit impacts to inadvertent discoveries.

Expanded Jamestown Rediscovery™ Center

The area of the APVA Jamestown Rediscovery™ Center has been tested at various times. It contains scattered 17th and possibly 18th century occupation (Outlaw 2001). Nonetheless, pre-construction archaeological excavations in the 1990s for the permit to build the Jamestown Rediscovery™ Center (a major addition to the north side of the Yeardley House) yielded predominantly negative results in the general area currently proposed for the additional expansion. This suggests that there are no significant archaeological resources at this location and that any that might be present are ancillary to the Ludwell Statehouse remains.

Foundations would be at a minimal depth, and pylon and pier construction would be required for the proposed expansion. Data recovery, if needed, would be performed by the APVA prior to construction. Utilities for this expansion, which were planned prior to the Jamestown Project in order to connect the APVA property to public water and sewer, would be located below grade within the prism of the APVA service road. The area would be tested by coring and monitored during construction. Therefore, there would be no anticipated adverse impacts to archaeological resources.

Observation Building

The Observation Building would be a reconfiguration of the existing Visitor Center, with exhibits and an overlook to the historic Townsite. The existing footprint of the Visitor Center was extensively impacted in the 1950s and 1970s, a change that constituted a major impact; therefore, no additional archaeological data recovery would be required in this area.

Water/Sewer Restrooms at Agricultural Exhibit Site

Alternative B proposes a water/sewer restroom in the same vicinity of the Agricultural exhibit area. This would require trenching for placement of the water/sewer lines, a potentially moderate to major impact. The shortest route possible would be taken to connect with existing lines. In order to avoid the sensitive archaeological resources in New Towne, the shortest route to the line would be laid along the Island Loop Drive. Trenching would be designed to avoid archaeological sites; however, the NPS archaeologist would monitor the construction of all associated trenching in the area.

Effects of Alternative C

In addition to the items listed under “Impacts Common to the Action Alternatives,” Alternative C proposes ground-disturbing activities at Neck of Land, Glasshouse Point, and Jamestown Island. These development actions are planned near

archaeological sites on NPS and APVA property and would require careful design and monitoring in order to protect the archaeological resources.

Neck of Land

Alternative C proposes a larger area of new development at Neck of Land than Alternative B. This development would include the new Visitor Center/NPS Collections/Intermodal Transportation Terminal facility, a parking lot, and a boat dock on Back River. The proposed plan for these facilities would potentially have major impacts to three archaeological sites previously located and partially tested on Neck of Land by the NPS. These sites are 44JC1047, 44JC1048, and 44JC1049 (Butts et al. 2001). Sites 44JC1047 and 44JC1048 are historic-period domestic sites containing buried, intact foundations. Site 44JC1049 is a prehistoric American Indian site, largely comprised of lithic debitage in the plowzone. In the planning process for this alternative, sites 44JC1048, and 44JC1049 were avoided entirely. A portion of site 44JC1047, the late 17th-early 18th century domestic site recently identified and tested by Colonial Williamsburg Foundation (CWF) archaeologists (Butts et al. 2001), could be majorly impacted by the proposed building facility due to footings and foundations. A Phase III data recovery program at the site would have to precede any construction. The completion of this program would mitigate any potential adverse impact by excavation or preservation of the site, requiring the building to be smaller or to be moved. The surfacing material for the parking lot would be placed atop the present day ground surface. The perimeter of all three archaeological sites would be marked by snow fencing and would appear on all construction documents. The NPS archaeologist would continually monitor any groundbreaking activity near these sites.

Glasshouse Point

Alternative C proposes the same actions at Powhatan Creek Overlook as discussed under Alternative B: a boat dock and footpath. Likewise, impacts from these structures would be the same as discussed under Alternative B.

Jamestown Island

Ticketing and Information Facility

The location of this small facility in the existing Island parking lot is east of site 44JC931, the 17th century site delineated by College of William & Mary archaeologists that is immediately beside the parking lot (Jones 2001). Because the Ticketing and Information Facility would only be 1,000 square feet, it can be easily located on a portion of 44JC930, a site where no further work is recommended as a result of prior 1930s excavation and later parking lot construction. These factors would ensure negligible impacts to significant deposits.

Observation Building

The Observation Building proposed in Alternative C would be the same as proposed under Alternative B; therefore, impacts would be similar.

Water/Sewer Restrooms at Agricultural Exhibit Site

The water/sewer connected restrooms proposed under Alternative C would have the same impacts as those proposed under Alternative B.

Effects of Alternative D

Alternative D differs radically from Alternatives B and C. This alternative keeps all proposed development on the Island, leaving Neck of Land unaltered. The lack of development at Neck of Land would result in negligible impacts to the archaeological resources in that area. Thus, no mitigation would be necessary for Neck of Land.

Also in Alternative D, there would be no boat docks. Not having a dock at the Powhatan Creek Overlook would safeguard the two shoreline sites (44JC106 and 44JC1019) from the minor impacts of any shoreline construction. Alternative D does maintain the plan to reconfigure the Glasshouse parking lot as discussed in elements common to the action alternatives.

Jamestown Island

Visitor Center/Educational Facility/ NPS Collections/Observation Building

On Jamestown Island, Alternative D proposes the extensive modification of the existing Visitor Center to accommodate the new Visitor Center, educational facility, NPS collections, and Observation Building. The plan would stay within the footprint of the existing Visitor Center's foundation, so there would be negligible impacts to surrounding land. Due to the sensitivity of this surrounding cultural landscape, NPS archaeologists would continually monitor construction and perform data recovery where necessary.

Effects of Alternative E

Similar to Alternative B, Alternative E proposes ground-disturbing activities at Neck of Land, Glasshouse Point, and Jamestown Island. These development actions are planned near archaeological sites on NPS and APVA property and would require careful design and monitoring in order to protect these resources.

Neck of Land

As in Alternative B, Alternative E proposes new development at Neck of Land intended to function as a gateway to both Jamestown Island and Jamestown Settlement. This new development would include an Intermodal Transportation Terminal, a parking lot, a hike/bicycle path, and a boat dock on Back River. Even though the parking lot would be slightly smaller and the hike/bicycle path crosses the Neck of Land marsh west to Powhatan Creek Overlook, impacts would be the same as those described under Alternative B.

Glasshouse Point

The terminus of the hike/bike bridge over Powhatan Creek and the hike/bike path to the Powhatan Creek Overlook potentially impact two archaeological sites, 44JC106 and 44JC1019 located along the Powhatan Creek shoreline. Site 44JC106 is a multi-component

site containing both prehistoric American Indian and 17th century English Colonial archaeological deposits. Both sites are deemed eligible for the National Register of Historic Places under Criterion D (potential to yield important information). The bridge terminus is located along the southeast edge of site 44JC106; construction in this area could result in minor adverse impacts to this archaeological site. Construction plans for the bridge would be on pilings in Powhatan Creek, keeping the bridge itself away from the archaeological site. The walkway from the bridge to the Overlook and the crossing at the Colonial Parkway would traverse a very small portion of site 44JC106. In order to mitigate this impact, the walkway would be built on fill above grade, without cuts into the sensitive archaeological site. The present day ground surface overlying these sites would be capped with fill to offer further protection, and in turn the fill would be graded and surfaced. Ground disturbance would therefore be minimal. The NPS archaeologist would monitor construction of the bridge and path. Impacts would be negligible, as together these efforts would avoid any adverse impact to the archaeological resource.

Jamestown Island

Visitor Center

Similar to Alternative B, Alternative E would locate the replacement Visitor Center in the existing Jamestown Island parking lot, and the parking lot would be partially reconfigured to accommodate the new facility. Impacts of this facility would be the same as those described under Alternative B.

Observation Building

The Observation Building proposed under Alternative E would be similar but half the size of the facility proposed under Alternatives B and C. Because the new facility also falls within the footprint of the existing Visitor Center, impacts would therefore be the same, and no archaeological data recovery would be required.

Cumulative Impacts

Cumulative impacts to archaeological resources could be both beneficial and adverse. In general, archaeological resources within the Jamestown area (outside of APVA and NPS protection) and Colonial NHP could be impacted by ongoing development and research activities within James City County and Williamsburg. Ground-breaking activities in the area could adversely affect yet to be discovered archaeological resources. These actions would largely be mitigated by county data recovery requirements. On the other hand, ongoing archaeological surveys, inventories, and management by the APVA, NPS, the Colonial

Williamsburg Foundation, the College of William & Mary, and others is increasing the knowledge and understanding of regional cultural resources.

Conclusion

Table 4-2 provides a summary of impacts to the identified archaeological sites at Jamestown. Due to the abundance of archaeological resources on both APVA and NPS property, the action alternatives with the most proposed elements would be the ones with the most potential to impact the archaeological resources. Alternatives B, C, and E have more potential adverse impacts to archaeological resources than Alternative D.

Table 4-2: Summary of Impacts to Identified Archaeological Resources

Site	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Site 44JC986 (Glasshouse Point)	Negligible	Negligible	Negligible	Negligible	Negligible
Site 44JC106 (Glasshouse Point)	Negligible	Minor (boat dock)	Minor (boat dock)	Negligible	Moderate (modal transport)
Site 44JC1019 (Glasshouse Point)	Negligible	Negligible	Negligible	Negligible	Negligible
Site 44JC1047 (Neck of Land)	Negligible	Minor	Major (foundation)	Negligible	Minor
Site 44JC1048 (Neck of Land)	Negligible	Minor (boat dock)	Minor (boat dock)	Negligible	Minor (boat dock)
Site 44JC1049 (Neck of Land)	Negligible	Minor	Moderate (parking lot)	Negligible	Minor
Site 44JC631 (New Towne)	Negligible	Major (foundation)	Negligible	Negligible	Major (foundation)
Site 44JC930 (New Towne)	Negligible	Negligible	Negligible	Negligible	Negligible
Site 44JC928 (New Towne)	Negligible	Negligible	Major (foundation)	Negligible	Negligible
Structure 19A (New Towne)	Negligible	Negligible	Negligible	Minor/Moderate (nearby foundation)	Negligible
Structure 112 (New Towne)	Negligible	Negligible	Negligible	Minor/ Moderate (nearby foundation)	Negligible

This is partially due to the proposed facilities on Neck of Land. Alternatives B and E avoid the archaeological resources on Neck of Land, while Alternative C would constitute a potential major adverse impact to a portion of site 44JC1047. Alternatives B and E, however, have elements with potential minor impacts to archaeological sites at the Powhatan Creek Overlook. Potential impacts to sites at Neck of Land, Glasshouse Point, Powhatan Creek Overlook, and on Jamestown Island in all the action alternatives would be mitigated as previously described.

Ground disturbance may preclude additional data retrieval at a future date and affect understanding of the site's resources; however, carefully planned investigations in select areas with high probability of yielding additional archaeological data, including artifacts, would result in beneficial impacts to understanding and interpreting the site's 17th – 20th century resources. The APVA and NPS archaeologists would diligently monitor any proposed construction to ensure resource protection.

Due to the constant monitoring of sites proposed for construction, data recovery before construction wherever necessary, consultation with the SHPO, and sensitive construction techniques, irreversible or irretrievable impacts to the archaeological resources at Jamestown would be minimized. It is noted, however, that any data recovery, if necessary, does constitute an irreversible and irretrievable impact on archaeological resources. Research and subsequent interpretation of those resources that have been excavated would partially mitigate their removal. In addition, the overall impact of each alternative would not constitute a major adverse impact to archaeological resources; therefore, impairment of these resources would not occur.

4.3.1.3 Historic Buildings and Structures

This section considers the impacts of each alternative on the historic structures and monuments on Jamestown Island, Glasshouse Point, and Neck of Land. The APVA historic structures and monuments on Jamestown Island include: Memorial Church, Dale House, Yeardley House, Mule Barn, Godspeed Cottage, Fort Pocahontas (Confederate Fort), 1901 seawall, John Smith Statue, Pocahontas Statue, Robert Hunt Shrine, First Assembly Monument, Memorial Cross, and Memorial Gates. The NPS historic or contributing structures and monuments include the 1907 Monument, Ambler House Ruins, Civil War fortifications, original boundary ditches, the Travis Family Cemetery, reconstructed ditches and berms, the Great Road Trace, Back Streete, the Highway Close to the River, and the Glasshouse ruins. On Neck of Land, the abandoned Route 31 road trace is the only extant historic structure. The Colonial Parkway is a structure documented separately on the National Register of Historic Places as nationally significant. Impacts on the Parkway are described under "Section 4.3.1.4: Cultural Landscapes."

In addition, Mission 66 structures being evaluated in the draft Determination of Eligibility are as follows:

Visitor Center: The original building is a Mission 66 structure. It was expanded and given a new entrance façade for the Bicentennial (1976). The alterations to the Visitor Center during the Bicentennial greatly altered the exterior and interior of the facility and impacted its integrity.

It is identified in the draft National Register of Historic Places documentation as non-contributing; however, the final National Register document has not been approved.

Pedestrian Footbridge: The footbridge across Pitch and Tar Swamp connects the parking area to the Visitor Center.

New Towne Site Interpretations: The site interpretations include brick outlines of 17th century structures, ditches, fence lines, and interpretative signage.

Island Loop Drive: The one-way Loop Drive, with interpretive stations, circumnavigates the eastern end of the Island.

Glasshouse Point/Glasshouse: The Glasshouse was a Mission 66 interpretation of a 1608 structure. The building burned and was rebuilt in 1976 with more contemporary materials.

Entrance Booths 1 and 2 and the Entrance Station: These structures welcome visitors, provide information, and collect entrance fees.

NPS Maintenance Facility: This complex adjacent to the Neck of Land area services Jamestown Island and the Colonial Parkway.

NPS Employee Residence: This building is part of the maintenance complex.

Methodology

The methodology used for assessing impacts on structures owned by the APVA and NPS is primarily based on the draft *National Register of Historic Places Documentation for Jamestown Island, Glasshouse Point, and Neck of Land* (McCartney 2001), which documents and evaluates the properties as contributing or non-contributing for final listing on the National Register. In addition, the NPS List of Classified Structures (LCS), which includes all historic and contributing structures in Colonial NHP, provided information on the structures' condition. The APVA properties do not have any similar documentation. In addition, the recently submitted draft *Cultural Landscape Report for Jamestown Island, Glasshouse Point and Neck of Land* (OCULUS 2002), which was used in the preparation of the pending Determination of Eligibility for the Jamestown Mission 66 landscape, provided information on the significance of Mission 66 construction.

With the exception of the footbridge across Pitch and Tar Swamp, the 1976 footbridge comfort station, and the entrance booths 1 and 2 at Glasshouse Point, none of the structures included in the draft National Register documentation or under evaluation would

be removed as a result of this project. The project also assumes that visitation to Jamestown and all of its facilities would increase as 2007 approaches, regardless of the alternative, including No Action.

For the purposes of evaluating potential impacts to historic structures, the thresholds of change for the intensity of an impact are defined as follows:

Negligible: The impact is at the lowest levels of detection and is barely perceptible or not measurable.

Minor: The action would not affect the character-defining features of a National Register of Historic Places eligible or listed structure or building.

Moderate: The action would alter a character-defining feature of the structure or building but would not diminish the integrity of the resource to the extent that its National Register eligibility is jeopardized.

Major: The action would alter a character-defining feature of the structure or building, diminishing the integrity of the resource to the extent that it is no longer eligible to be listed on the National Register.

Effects of Alternative A (No Action)

The main focus of this alternative would be the continued protection and preservation of the existing historic structures. There would be no alteration to the existing historical structures and monuments except for those upgrades already planned as of 2001. Therefore, no construction or disturbance activity would be envisioned for Jamestown Island, Glasshouse Point, or Neck of Land. The APVA and NPS would complete the update to the existing National Register documentation and determine those resources eligible for the National Register. APVA and NPS maintenance staff would continue to maintain structures as feasible; however, preservation and stabilization work would be subject to limited staffing and funding. Some degradation is expected to occur, especially with the visitation increase during the 2007 commemorative period. The impact on cultural resources would be negligible.

Impacts Common to the Action Alternatives

Alternatives B, C, D, and E (the action alternatives) share several common features that may affect historical structures. In addition to the impact analysis for structures affected by all of the action alternatives, a list of structures not affected by the action alternatives is also included. The impact analysis is based on proposed development and construction, but not on the potential effects of the interpretive plans.

Structures that would not be Impacted

Memorial Church

None of the proposed alternatives would result in physical changes to the Memorial Church or its immediate environs.

Fort Pocahontas (Confederate Fort)

The Confederate Fort, Fort Pocahontas, would not be affected by the proposed construction or development in any of the action alternatives. However, increases in visitation and improved signage would increase the movement and circulation of visitors to and around the fort. Indirect impacts resulting from increased visitation would be minimal, but could include trampling, forming random footpaths, and exceeding carrying capacity at the site. This potential impact would be monitored as visitor levels increase, and new circulation patterns would be developed as necessary. In addition, the Fort would continue to deteriorate due to natural weathering processes.

Jamestown Island Seawall

The Jamestown Island Seawall would remain in its current condition in all of the action alternatives. Inspection and constant maintenance would continue in order to maintain its condition.

Statues and Monuments

The John Smith Statue, Pocahontas Statue, Robert Hunt Shrine, First Assembly monument,

Memorial Cross, and the APVA Memorial Gates adjacent to the 1907 Monument would remain in their current locations in all of the action alternatives. Also, these statues and monuments would not be impacted by the action alternatives; however, there would be specific devices in place to ensure protection of these features during the construction of new facilities.

Loop Drive

Loop Drive would remain in its current condition and alignment in all the action alternatives. Driving, bicycling, and walking would remain the primary activity on the Loop Drive. Indirect effects related to increased visitation could result, including stopping along the road, standing, and trampling roadside vegetation. Changes to the interpretive signage on Loop Drive are proposed in all of the action alternatives. This action does not impact Loop Drive but improves the interpretive message. The impact would therefore be negligible.

Glasshouse Facilities

The Glasshouse Ruins interpretive pavilion, the reconstructed Glasshouse, the NPS comfort station, and the Harrington House on Glasshouse Point would not be affected by any of the alternatives. Changes proposed for the parking lot would not impact the integrity or location of these structures.

Godspeed Cottage

There would be no impacts to the Godspeed Cottage from any of the alternatives: it would remain in place without any changes to its existing dimensions or usage.

Structures that would be Impacted

Ambler House Ruins

An observation platform at the second level of the Ambler House is proposed in all the action alternatives, resulting in both beneficial and adverse impacts to this structure. The viewing

platform would be constructed as an independent structure system within the ruin and would only contact the original walls for the purpose of protecting and stabilizing those walls. The existing bracing system is structurally inadequate, visually intrusive, and is not sustainable. The proposed new structural system would be designed to allow for archaeology to take place on the ground level at a later date.

Depending on how the overlook and interpretive panels are designed, impact would potentially be beneficial to visitor understanding of the landscape. The insertion of a new overlook structure within the ruins could result in the loss of the existing architectural stabilization system, which represents early 20th century methods of material cultural conservation. This stabilization system and its potential significance are discussed in detail in “Section 4.3.1.4: Cultural Landscapes.” Overall, the level of impact would be long-term, adverse, and moderate, as the impact is measurable and perceptible but does not diminish the integrity of the resource to the extent that its National Register eligibility is jeopardized.

Footbridge and Restrooms

The footbridge across the Pitch and Tar Swamp and the NPS restrooms adjacent to the footbridge would be removed in all action alternatives. The existing footbridge, the ramp to the Visitor Center, and the restroom are not universally accessible nor are they sustainable. According to the draft *Cultural Landscape Report* (OCULUS 2002), the restrooms and the ramp to the Visitor Center are not contributing features of the cultural landscape or Mission 66 period. However, the footbridge is considered a contributing feature of the original Mission 66 circulation concept. Therefore, removing the footbridge would result in a moderate adverse impact to the Mission 66 landscape. In order to compensate for this, a new footbridge would be constructed west of the existing footbridge,

offering the visitor an expansive view of the Townsite and James River. In addition, the function of the restrooms and ramp would be replaced in the new facilities.

Effects of Alternative B

APVA Property

Dale House

In Alternative B, the Dale House would be renovated to provide food and refreshments for visitors to Jamestown Island. This would require some renovation of the interior and minor exterior modifications. Food preparation and/or food storage areas inside the building would be built in accordance with health department regulations. Modifications to the interior would be limited and undertaken only for the purpose of enhancing plumbing facilities for health and sanitary requirements. The renovated Dale House would serve light fare prepared offsite and brought in daily, and most food preparation and serving activities would be accomplished with freestanding equipment rather than with built-in equipment. Seating would be provided in the interior and on a patio facing the James River. The existing administrative office, exhibits, and artifact processing would be relocated to the nearby, expanded Jamestown Rediscovery™ Center (the Yeardley House).

Exterior changes to the site would be necessary for clarity of circulation and increased outdoor seating accommodations for this important visitor facility. Changes would include improved circulation through definition and rehabilitation of existing pathways, signage, and structure to the outdoor eating area on the James River side of the Dale House. Some fencing would be required if the Dale House were to serve alcohol. Any exterior improvements to the Dale House site would not change or affect the façade of the structure or the view of the façade from either the Island or the James River. There would also

be no vertical changes to the building or site that would visually change any view to the existing structure. Any material used would be in character with the existing building and overall design vocabulary for the entire project site.

Overall changes would constitute a long-term, beneficial impact, as it would provide an essential new visitor service on Jamestown Island and allow for the removal of the existing temporary food shack that is adjacent to the Dale House. Changes to the site would be minimal, give opportunity for much needed site rehabilitation, and add overall quality to the entire design concept plan. Impacts to the historic structure and its integrity would be long-term and minor.

Jamestown Rediscovery™ Center

The Jamestown Rediscovery™ Center would be expanded to accommodate the NPS portion of the Jamestown collection in addition to the APVA portion currently housed there. The expanded facility would provide state-of-the-art research and curatorial facilities, and new building space would be available for conservation activities in close proximity to research and archival storage areas, increasing the efficiency of the curation and research process.

The impact to the existing structure would result from the construction of the proposed expansion. The proposed expansion would connect to the most recent addition to the Yeardeley House (the Jamestown Rediscovery™ Center) and not directly to the original 1907 structure. Potential impacts arise from the size of the expansion and its architectural connection to the existing building. The proposed new expansion would be designed to allow the original 1907 façade to remain visually dominant. Architectural design and choice of materials and colors would complement the character of the existing building, while embracing the latest principles of sustainability and archival protection. The extent

of impacts and acceptable mitigation would be determined by the architectural design in consultation with the SHPO. Overall, the impact would be long-term, adverse, and moderate.

NPS Property

Entrance Booths and Entrance/Ranger Station

Alternative B would remove entrance booths 1 and 2, but retain the existing Entrance/Ranger Station. The removal of the entrance booths would change the spatial character of the entry onto Jamestown Island, giving a more open, less obstructed vista eastward across the Isthmus toward Jamestown Island. This would potentially be a beneficial impact to the visitor experience, allowing visitors a more welcoming unobstructed experience than currently exists at this location. The entrance booths and the Entrance/Ranger Station have been designated as non-contributing elements to the Colonial Parkway. This complex of structures was also determined by the draft *Cultural Landscape Report* (OCULUS 2002) as non-contributing to the Mission 66 landscape. If the buildings were removed they would be fully documented and entered into the compliance records. (See the “Cultural Landscape” section of this document for further description.) The impact would be long-term and minor.

Visitor Center/Observation Building

Alternative B proposes the reconfiguration of the current Visitor Center into the Observation Building. The Observation Building would have 5,000 square feet of space. The exact footprint location would be determined in design development, but in any scenario, it would alter the Visitor Center and stay within its existing footprint. This alternation would be an adverse impact to the Visitor Center, as it would dramatically change both the architectural character and the function of the building. However, the draft National Register documentation does not consider the Visitor

Center to be significant as a Mission 66 building, and it has no other historic or intrinsic architectural preservation value. The reduction of the building footprint would render the building less intrusive on the historic 17th century Townsite. The impact would be long-term, adverse, and moderate.

Hike/Bicycle Path

The proposed hike/bicycle path in Alternative B would occupy a section of the old state Route 31. A road in this location is also visible on Civil War era maps. This abandoned two-lane asphalt roadbed still has visible white painted stripes down the center. Some resurfacing may be required but for the most part, the roadbed, the shoulders, and drainage ways are in good condition. Impacts to the road trace would be minor.

Effects of Alternative C

APVA Property

Dale House

Modifications to the Dale House would be the same as those described under Alternative B; therefore, impacts to this historical structure would also be the same, long-term, adverse, and minor.

NPS Property

Entrance Booths and Entrance/Ranger Station

Under Alternative C, the Entrance/Ranger Station and entrance booths 1 and 2 would remain and be staffed by NPS rangers; therefore, the impact would be negligible.

Visitor Center/Observation Building

The proposed plans for the Observation Building would be the same as those discussed under Alternative B; therefore, the impact to the Visitor Center would be long-term, adverse, and moderate.

Effects of Alternative D

APVA Property

Dale House

In Alternative D, there would be no change to the Dale House. It would retain its existing functions, and the temporary food shack would also remain as part of the Dale House site. The impact would be negligible.

NPS Property

Entrance Booths and Entrance/Ranger Station

The Entrance/Ranger Station and entrance booths 1 and 2 would remain and would be staffed by NPS rangers. The impact would be negligible.

Visitor Center/Observation Building

Alternative D proposes a major enlargement of the existing Visitor Center to accommodate expanded visitor services, NPS curatorial storage and research, and the new Observation Building. The new Visitor Center design would be an impact on the existing structure; however, the draft National Register documentation does not consider the Visitor Center to be significant as a Mission 66 building, and it has no other historic or intrinsic architectural preservation value. The proposed major expansion of the Visitor Center would be an adverse impact on the surrounding Townsite landscape. The new much larger Visitor Center would be visually intrusive and would be impossible to mitigate with landscape screening. The impact would be long-term, adverse, and major.

Effects of Alternative E

APVA Property

Dale House

In Alternative E, the Dale House (1907) would become a lounge/reception center for volunteers

and donors to the APVA and NPS. APVA administration and artifact processing would be transferred to the existing Jamestown Rediscovery™ Center. The current exhibits would be shown in secured cases and made to fit with the reconfigured interior. The center section would be fitted with seating, climate control, and vending type refreshments (delivered in sealed packaging, not requiring onsite preparation). Impacts to the historic structure would occur only on the interior and would be minor. The temporary food shack that serves visitors with refreshments and light fare would also remain as part of the Dale House site.

NPS Property

Entrance Booths and Entrance/Ranger Station

As described under Alternative B, Alternative E would remove the entrance booths 1 and 2, but retain the existing Ranger Station. Therefore, the impacts would be the same as described under Alternative B: beneficial to visitor experience and viewsheds, but long-term, adverse, and minor for the structures.

Visitor Center/Observation Building

As in Alternatives B and C, this alternative proposes the reconfiguration of the current Visitor Center into the Observation Building. However, the facility proposed under Alternative E would be slightly smaller with only 2,500 square feet of space. The exact footprint would be determined in design development, but in any scenario it would alter the existing Visitor Center. This alternative would constitute an adverse impact to the Visitor Center, as it would dramatically change both the architectural character and function of the building. However, the draft National Register documentation does not consider the Visitor Center to be significant as a Mission 66 building, and it has no other historic or intrinsic

architectural preservation value. The reduction of the building footprint would render the building less intrusive on the historic 17th century Townsite, a beneficial impact for viewsheds, visitor experience, and cultural landscapes. The adverse impact would be long-term and moderate.

Cumulative Impacts

Any of the alternatives, including Alternative A, would function within an environment of increased visitation, simply from the awareness and attention generated by the 2007 commemorative year. However, a century or more of exposure to constant visitation and use resulted in limited deleterious effects, and no increase in that effect is foreseen to the historic structures given the adoption of any of the alternatives. Therefore, cumulative impacts to historic structures would be minimal.

Conclusion

A summary of impacts to historic structures can be found in Table 4-3. Irreversible/irretrievable actions are development actions that would result in removing a structure from the National Register of Historic Places. Although there are some adverse effects or potential adverse effects described in the alternatives, mitigation measures reduce the impacts upon the individual structures and the landscape. In all alternatives the impacts do not result in irreversible or irretrievable impacts to historic structures. Overall, impacts related to Alternative A, the No Action Alternative, would be negligible. Impacts related to Alternatives B, C, and E would be moderate, while under Alternative D impacts would be minor. Additionally, the overall impact of each alternative would not constitute a major adverse impact to historic structures; therefore none of the proposed alternatives would result in impairment to these important resources.

Table 4-3: Summary of Adverse, Long-term Impacts to Historic Buildings and Structures

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Ambler House Ruins	Negligible	Moderate	Moderate	Moderate	Moderate
Footbridge and Restrooms	Negligible	Moderate*	Moderate*	Moderate*	Moderate*
Dale House	Negligible	Minor	Minor	Negligible	Minor
Yardley House	Negligible	Moderate	Negligible	Negligible	Negligible
Entrance Booths and Entrance/ Ranger Station	Negligible	Minor*	Negligible	Negligible	Minor*
Visitor Center	Negligible	Moderate*	Moderate*	Major	Moderate*
Overall Impact	Negligible	Moderate	Moderate	Minor	Moderate

* Dependent on Determination of Eligibility and contribution of feature to Mission 66 landscape.

4.3.1.4 Cultural Landscapes

The study area for the cultural landscape impact analysis begins its eastern point from the woodland edge of Neck-O-Land Road within the NPS boundary and follows west, incorporating all NPS and APVA property. This includes the Colonial Parkway corridor, Glasshouse Point, Neck of Land, and the entire Jamestown Island. It also includes Back River, Sandy Bay, and viewsheds reaching to the Surry County shoreline.

Existing Landscape Types

Three historic landscapes can be clearly observed as a result of the field and document research for the development of the *Jamestown Island CLR* (Oculus 2002). The individual features that reflect their specific time period contribute to the definition of these landscapes. They are directly linked to natural systems and major human development activities on and surrounding Jamestown Island. All identified landscapes retain a high level of historical integrity.

The landscape that most accurately reflects the 17th century historic scene is the existing natural environment on the Island and its defining bodies of water. Marshes, rivers, and dense woodland sustained the indigenous people and greeted members of the Virginia Company upon their

arrival. In addition, other 17th century Island features include the Travis family cemetery, historic boundary ditches, and roadways.

The area included in the APVA property defines the second historic landscape. Features reflect the memorialization period of Jamestown Island between the end of the 19th century and the first half of the 20th century. The location of remaining landscape features and overall design of the site still reflect the original intention of a park-like commemorative landscape.

The third landscape is the mid 20th century modern interpretive landscape built by the NPS; it includes Glasshouse Point, the Colonial Parkway, New Towne, and the Island Loop Drive. This represents a large-scale designed landscape that was initiated in the 1940's and completed in 1957 as part of the Mission 66 park development period. Interpretation was also incorporated into Old Towne, but its physical impact did not detract from the commemorative landscape.

There are landscape features and historic structures from the 18th to the mid-19th centuries that exist throughout the Jamestown Project area. While they are contributing features in understanding the layers

of history, they do not emerge as key elements that define a larger landscape. These would include civil war earthworks, orchard remnants, and architectural ruins like the Ambler House.

Methodology

In order to understand the larger landscapes and their relationship to the sub area components, buildings, structures, and landscape features are organized within the impact analysis for each alternative into five geographical areas: Jamestown Island (including the Loop Drive), Old Towne, New Towne, Glasshouse Point, Neck of Land, and the Colonial Parkway.

The impact indicators used to define impacts on cultural landscapes are based on the Section 106 methodology to determine adverse and no adverse impact. The intensities are defined as:

Negligible: The impact on cultural landscapes is at the lowest level of detection, barely perceptible, and not measurable.

Minor: The impact on cultural landscapes is measurable or perceptible, but it is slight and localized within a relatively small area of a site or group of sites. The impact does not affect the character-defining features of a National Register of Historic Places eligible or listed landscape and would not have a permanent effect on its integrity.

Moderate: The impact is measurable and perceptible. The impact changes one or more character-defining features of a cultural landscape but does not diminish the integrity of the resource.

Major: The impact on cultural landscapes is substantial, noticeable, and permanent. The impact is severe or of exceptional benefit. For a National Register eligible or listed landscape, the impact changes a character-defining feature of the resource, diminishing its integrity to the extent that it may no longer be eligible for listing on the National Register.

Mitigation efforts have been identified for all alternatives in order to minimize the impacts of actions on the cultural landscape. They are design considerations and guidelines responding to the character of the landscape. These guidelines would be followed and are general enough to apply to both the commemorative and interpretive landscapes of the study area. The following list defines some, but not all, of these guidelines:

- Provide educational and interpretive opportunities to discuss how changes to the landscape have occurred due to new scholarship and research findings. This is consistent with the Mission 66 philosophy of providing thorough scientific and accurate information to the visitor through interpretation.
- Preserve original fabric as much as possible.
- The addition of new features is preferable to removing existing features. If it is necessary to remove a feature, document it and use the information to educate the public about the resource.
- Use compatible materials.
- Integrate new site elements in a sensitive and compatible way.
- New structures and features must be hidden from important viewsheds with effective vegetative screening.
- Retain the overall spatial character of each landscape area.
- Recognize and maintain the nature of each design type. (i.e. commemorative, interpretative).

Also, in addition to the Jamestown Project actions, it is assumed that there would be cultural landscape impacts from the new *Jamestown Island Interpretive Plan* (Haley Sharpe Design 2001b). This plan developed interpretive themes that integrate existing landscape components, but the ideas are only conceptual at this point in time. Therefore, it is not possible to include an assessment of impacts related to the plan in this document. These impacts

will be addressed in a separate environmental assessment once concrete design ideas have been proposed.

Effects of Alternative A (No Action)

The completion of the *Jamestown Cultural Landscape Report* (OCULUS 2002) will help guide the future management of APVA and NPS landscapes. Analyzing the significance of features and developing a treatment plan for the properties would provide both organizations the knowledge and maintenance tools to preserve significant landscape elements and meet the interpretation mission.

Implementation of the treatment plan would be a function of staffing and funding. Unfortunately, staffing and maintenance funding for both the APVA and NPS has not increased proportional to the cost of living and operation increases. The result is reduced staffing to provide maintenance of landscape features and a backlog of work in the upkeep and preservation of these features. Such shortfalls of funds have already affected the NPS's ability to preserve memorials and interpretive fences in New Towne and repair the audio stations and benches. This is expected to remain the same under Alternative A, the No Action Alternative. Additionally, dead or damaged trees within the developed areas and along the Parkway are removed but not replaced, impacting important viewsheds and risking the loss of potentially significant landscape features.

Because no construction or development is planned under the No Action Alternative, features such as historic plant material related to the Parkway and domestic habitation, the earthwork at Powhatan Creek Overlook, historic road traces, the Parkway and its bridges, and all the various building structures and interpretive features would remain unchanged and be maintained as is. Therefore, there would be no adverse effect on the Mission 66 or commemorative vehicular or pedestrian circulation systems or on the arrangement and scale of building clusters within the study area.

Impacts Common to the Action Alternatives

Impacts common to the action alternatives are organized by geographical area and listed below.

Jamestown Island

New Loop Drive Sign System

There is no proposed change to the alignment of Loop Drive or the pull-offs thereby having no impact on the existing Mission 66 design of the circulation system. The original Sidney King paintings have been removed and preserved in the NPS collections and replaced with fabricated, printed copies. New frames of identical design have replaced all the original frames that held the paintings. All of them are non-contributing structures and their replacement constituted a negligible impact. Under the proposed action alternatives, pull-offs would be minimally improved and new signs would replace the existing waysides in the same locations, thereby retaining the Mission 66 philosophy of providing interpretive panels at the pull-offs. The impact would be negligible. There is one metal commemorative sign that was paid for by the Meriwether Lewis family to honor one of their ancestors who bought property on the Island. This feature is located on the last pull-off to the right before the Loop Drive connects back with two-way traffic. This is a contributing element and would remain as is.

Old Towne

Ludwell Exhibit Facility and Expanded Parking at the Jamestown Rediscovery™ Center

The new Ludwell facility would be designed to have a low profile using natural colors and materials and would be located behind an existing cluster of mature trees. Collectively, this would minimize the visual intrusion by screening the building from the commemorative landscape. However, construction of the facility would require the removal of a small holly tree, five loblolly pines, and three red cedar trees of less than 12 inches

diameter; a spirea shrub; and five mature bayberries. The bayberries would be relocated to an area where they would help screen the visual impact of the relocated footbridge leading to the proposed Observation Building. The size of the plant materials indicate that they are less than 50 years old and were meant to screen the service area from the commemorative landscape. Their removal is not an impact to the historic vegetation patterns or the viewshed from the open area.

Construction of the Ludwell facility and expansion of the parking lot would also require the movement of the non-historic APVA service shed, while the Mule Barn would remain in its current location. The parking lot expansion would extend westward but would still be located behind the existing cluster of mature trees and the proposed new facility. This would minimize the visual intrusion of the parking area by screening the area from the larger commemorative landscape. The current view from the APVA access road would not change, as there is currently a view of the parking lot now.

Overall, the entire development of the new facility in its proposed location would be considered a no adverse effect to the commemorative landscape. It would be a long-term, minor adverse impact because portions of the building would be visible despite the vegetative screen.

Minor Repairs to the APVA Service Road

In addition to the placement of new sewer and water lines within the current roadbed, the existing culvert would be replaced and the road would be repaired and raised no higher than two feet in order to make it passable during heavy rainstorms. There would not be any change in the integrity of the road in its horizontal alignment. This is considered general maintenance to the historic feature and would be covered as a categorical exclusion in the Programmatic Agreement with the SHPO. Therefore, this action would have a negligible impact on the landscape.

New Towne

Removal and Relocation of the Pedestrian Bridge Connection to the Visitor Center / Observation Building

The removal of the existing pedestrian footbridge to the current Visitor Center would be an adverse effect because it constitutes the permanent loss of a Mission 66 structure that has been determined to be a character-defining feature. A new footbridge would be relocated westward and provide the same function of connecting the Island parking lot with the historic Townsite. The proposed location would be at the junction of the commemorative and interpretive landscapes. When seen in the larger context, its removal and replacement does not diminish the overall interpretive landscape integrity. Its impact, therefore, is long-term and moderate. To offset the visual intrusion of the new footbridge from the commemorative landscape, the bulk of it would be screened within existing vegetation of bayberry, loblolly pine, and holly. Strategically placed viewpoints and panoramic views from the footbridge would help meet the interpretive plan and goals of the Jamestown Project.

Rehabilitation of the Base of the 1907 Monument

The removal of the plaza, retaining wall, and trees would be a no adverse effect on the Mission 66 design because it is removing materials and a spatial design that reflects additions made in 1976. Also, the removal of these elements would uncover the original steps and landscape elevation of the 1907 monument, which is an established contributing historic structure. The early plaza's original function as a location point for viewing both Old and New Towne would be replaced within the Observation Building. Because a new plaza would not be built in its original location, this action is considered to have a long-term, minor impact.

Agricultural Exhibit Site

This is a new cluster of structures and vegetation within the landscape that would alter the spatial and visual character of the Mission 66 landscape by the addition of structures and objects in an existing open field. However, its intent as an interpretive landscape device is in keeping with the Mission 66 design philosophy, and the structures would be kept within a scale that is in proportion to the site. Its addition is considered a no adverse effect to the interpretive landscape of New Towne. New vegetation would screen the new structures in a way that reflects the overall planting pattern within New Towne. The Agricultural exhibit site would be a long-term, minor impact because it would not affect any character-defining features of the overall landscape.

Ambler House Ruins Overlook and Stabilization

The proposed overlook would impact the interpreted views from the ruins and views from other locations in the New Towne area. Impacts could potentially be beneficial to visitor understanding of the landscape depending on how the overlook and interpretive panels are designed. Views are considered a character-defining feature of the interpretive landscape; therefore the new structure would be designed in a way that would not impact views from within New Towne. Overall, the action would have a negligible impact on the interpretive landscape. It is therefore considered as having a no adverse effect.

Glasshouse Point

Reconfiguration of the Glasshouse Parking

The parking lot would be reconfigured to accommodate six additional buses, requiring minor pavement and curbing changes. Curbing has been replaced and repaired over time, so there would not be a loss of historic fabric. Collectively, the character-defining features of a circular traffic pattern and a central island would

be retained. The maximum width for alterations along the parking lot edge is 32 feet, which is the area found to be devoid of any contributing archaeological artifacts. Twelve of the 32 feet along the parking lot edge consist of a gravel path. The remaining 20 feet are forested. The maximum woodland disturbance for alterations would be approximately 4,302 square feet. Mitigation plans include removing an equivalent area of invasive bamboo located southeast of the parking lot and replacing the area with the same native plant species seen in the adjacent woodland habitat. This action is considered a no adverse effect and a long-term minor impact because there would be a perceptible change in the parking lot details.

Colonial Parkway

Modal Transfer on Island

The addition of this function would require a redesign of the original Island parking lot layout. The parking lot is considered a component of the Colonial Parkway. Action alternatives B, C, and E require reconfiguration of the parking lot and the planting materials, which means it is removing some historic fabric and altering character-defining features. However, it does not diminish the integrity of the resource because it still functions as a parking lot and is still connected to the Colonial Parkway. Therefore it is considered an adverse effect, but only a long-term, moderate impact. Accommodating a modal transfer stop in Alternative D would require fewer changes to the character-defining features to accommodate a shelter and pull off. This action would therefore be considered a no adverse effect and a long-term, minor impact.

To offset all changes, three guidelines previously mentioned would be applied to all modal transfer designs: using compatible materials, integrating new site elements in a sensitive and compatible way, and retaining the overall spatial character of the landscape area. An example

would be to provide wide parking islands and large canopy trees within the new design. In addition, the details of the curbs and the curvilinear design of the parking layout should be retained.

Hike/Bike Trail from Powhatan Creek Overlook to Glasshouse Point to Jamestown Settlement

Under Alternatives B, C, and E, the new at grade trail crossing the Colonial Parkway to connect Powhatan Creek Overlook with Glasshouse Point would not require any change to the Parkway pavement. This would be considered a no adverse effect on and a negligible impact to the Parkway. In all action alternatives, the location of the trail from the Glasshouse parking area to its connection to the proposed multi-use trail along Route 359 would be completely screened from the Parkway. It is, however, a new design element at the edge of a Mission 66 landscape and would require the removal of trees for its construction; however it would be considered a long-term minor impact within this landscape.

clearly marked on landscaping plans so the tree roots acting as water courses can be found.” The location of the building and its required clearance would result in the removal of several historic and non-historic trees. One small crape myrtle, a red cedar, and a red oak, all younger than 50 years, are the non-historic trees to be removed. The historic trees requiring removal include: an Oriental arborvitae with a 23-inch diameter at breast height (DBH), two white mulberries with 26 inch DBH, and a red cedar with a 26 inch DBH. These trees have been determined to be contributing elements to the commemorative landscape; therefore this action would be considered an adverse effect. However, the view from the open area would be impacted because four large trees and a cluster of old crape myrtles remain intact in front of the proposed building location. A yellow buckeye with a 16-inch DBH, an American elm with a 33-inch DBH, and a pecan with a 40-inch DBH also partially screen the building, minimizing its impact from the commemorative view.

Effects of Alternative B

Old Towne

Jamestown Rediscovery™ Center Expansion and Parking Lot Modification

The proposed addition for NPS collections and joint research would be located behind and east of the Jamestown Rediscovery™ Center. The existing structure would hide the northern addition, but the eastern wing would be partially seen from the APVA grounds because several large trees would be removed to accommodate the building and comply with NPS curatorial building protection guidelines. According to the *NPS Museum Handbook, Part I*, Chapter 10 (2000e), the Emergency Planning Risk Assessment Worksheet states, “The [collections] building is at least 15 feet from shrubs, bushes, or trees.” Another section explains, “All existing tree and shrubs within 15 feet of the building are

Collectively, the actions change one or more character-defining features, in this case, a historic planting cluster. However, the impact does not diminish the integrity of the commemorative landscape to the point that it may no longer be eligible for listing on the National Register. The building would be partially seen from the open area, but its impact would not diminish the visual integrity. It is therefore considered to be a moderate impact.

Dale House Renovation

In Alternative B, the Dale House would be renovated to provide food and refreshments for visitors to Jamestown Island. This would require some renovation of the interior and minor exterior modifications. Seating would be provided in the interior and on a patio facing the James River. The existing administrative office, exhibits, and artifact processing would be relocated to the nearby, expanded Jamestown

Rediscovery™ Center. The interior building renovations would not be considered an impact on the cultural landscape.

Exterior changes to the site would be necessary for clarity of circulation and increased outdoor seating accommodations for this important visitor facility. Changes would include improved circulation through definition and rehabilitation of existing pathways, signage, and structure to the outdoor eating area on the James River side of the Dale House. Some fencing would be required if the Dale House were to serve alcohol. Any exterior improvements to the Dale House site would not change or affect the façade of the structure or the view of the façade from either the Island or the James River. There would also be no vertical changes to the building or site that would visually change any view to the existing structure. Any material used would be in character with the existing building and overall design vocabulary for the entire project site.

Overall changes would constitute a long-term, beneficial impact, as it would provide an essential new visitor service on Jamestown Island and allow for the removal of the existing temporary food shack that is adjacent to the Dale House, an existing impact on the commemorative landscape. Changes to the site would be minimal, give opportunity for much needed site rehabilitation, and add overall quality to the entire design concept plan. Impacts to the historic structure and its integrity would be long-term and minor.

New Towne

Rehabilitation of the Existing Visitor Center as the New Observation Building

The rehabilitation of the Visitor Center includes landscape changes around the building to accommodate the reduced footprint of the Observation Building. The removal of the amphitheatre, monument plaza, retaining wall,

and trees would be included in the plans. As described under “Impacts Common to the Action Alternatives,” removal or reconfiguration of these public spaces would be considered a no adverse effect on the Mission 66 design because it is removing construction materials and spatial design aspects that have been altered since 1957, the period of significance. Although the building would be reduced in size, its location as the information hub for interpretation functions is consistent with the philosophy of the Mission 66 master plan. It therefore would be considered a no adverse effect and a negligible impact to the interpretive landscape.

Neck of Land/Colonial Parkway

Intermodal Transportation Terminal and Parking Lot at Neck of Land

The main hub for the multimodal concept at Jamestown is proposed at Neck of Land under Alternative B. The proposed 2,000 square-foot facility would orient the visitor to Jamestown and provide them with information to make their stay more interesting. It is also the main location for parking during peak seasons and would include shuttle service for those visitors who do not want to walk, bicycle, or ride the boat to the Island. As proposed, the new development would require the removal of a large area of forest that can be seen from the Colonial Parkway at Neck of Land. Parking for 250 cars (phased 150, then 100), the hike/bicycle trail, and the building would be placed as far south on the parcel to retain a buffer of as much existing wooded vegetation as possible while not encroaching into the 100-foot Resource Protection Area (RPA) along Neck of Land marsh. The size of the parking lot would necessitate that it be built into one of three open areas found along this stretch of the Parkway.

Two design intents of the Parkway are contradicted by this development. One is that all modern development should be screened from

the roadway. The other is that there is a sequence of spatial changes defined by vegetation or views along the entire stretch of roadway. In this section of the Parkway, the spatial character of the roadway edge changes with a series of open lawn areas bordered by woods. The parking lot would be seen from the Parkway in the middle open area, which is 100 hundred feet deep and 450 feet wide. To mitigate this effect, the parking lot must be screened. A total width of 90 feet of area remains from parking lot edge to the Parkway pavement edge. A required 15-foot setback as clear zone along the Parkway reduces the total available area for vegetated screening to 75 feet. This buffer would provide a screen for the parking lot during the winter season. The 0.55-acre area would be forested with the same mixed deciduous/evergreen biotic community found on site. As a result, the spatial edge of the Parkway would change perceptibly by the removal of one of the three open areas, a character-defining feature. However, the rhythm of the open/enclosed sequence remains through this stretch of road because the adjacent areas remain unchanged. Therefore, the filling of the one open area with vegetation to successfully screen the parking lot is considered a no adverse effect and a long-term, moderate impact.

Current traffic data analysis recommends that in order for visitors to safely turn into the Neck of Land facilities from the Parkway, the Parkway pavement must be widened by a minimum of 20 feet to accommodate turning lanes. This is a departure from Parkway design standards and constitutes a deviation in traditional design. Mitigation measures would be to design a divided island using compatible materials based on traffic divider design such as the granite block pavers at the Route 359 intersection. In addition, the widening of the pavement would be done in a way that would be carefully integrated into the Parkway alignment. As a result, this action would be considered an adverse effect and a long-term, moderate impact to the Parkway

landscape. It would alter the road in a way that changes the character-defining features by having a unique intersection in a new area but does not diminish the integrity of the Parkway overall.

In addition to impacts on the Parkway, the location of the access road for the Neck of Land facilities would remove 90 linear feet of the old Route 31 road trace, which is a contributing feature for the Neck of Land area. The removal of historic fabric is an adverse effect; however it is a very small portion of the entire road trace, which would remain intact. Minimal removal would not diminish the integrity of the historic road trace; therefore the impact is long-term and moderate.

Boat Dock and Access Trail to Intermodal Transportation Terminal

The dock at Neck of Land would be the initial point to begin the interpretive water tour. Similar to the Powhatan Creek Overlook, this area is a steep bluff and would require skillful grading and layout of the dock and trail to avoid major grading changes. The construction of the new path and boat dock would result in the loss of vegetation. The current proposed location of the boat dock and Intermodal Transportation Terminal would not be seen from the Parkway and would not be considered an adverse effect on the Parkway. It would be considered a minor impact to the cultural landscape of Neck of Land because the removal of vegetation would be a measurable change when considering the cumulative impact on vegetation from the Neck of Land facility improvements.

Hike/Bicycle Trail

As with the hike/bicycle trail proposed through the Glasshouse area, the trail over the marsh and crossing the Back River to the Island is an important component of the multimodal system and provides opportunity for interpretation of the area's natural resources. The impact of the

trail on scenic views from the Parkway is a main factor in determining the overall impact of the trail. The existing tree/shrub vegetation would screen the boardwalk, which must be elevated 10 feet over the over the marsh vegetation to preserve the biotic system. Within the forested area, the trail would follow the old Route 31 road trace at the correct elevation and would not be seen from the Parkway viewshed at the isthmus. The bridge over Back River, as it is proposed, would not be visible from the Parkway. Adaptive reuse of the abandoned road grade and the establishment of the overlook in its proposed location would have minimal impacts on the historic road corridor. This action would be considered a no adverse effect and be considered a negligible impact to the Parkway landscape.

Colonial Parkway

Replacement Visitor Center/Education Facility at Existing Island Parking Lot

The purpose of moving the Visitor Center to the parking lot is twofold: it is the only additional available land outside the 100-year floodplain of the developed area and it allows visitor orientation to Jamestown before arrival at the historic Townsite. The proposed addition also provides space for the increased demand for educational programs. The addition of a new building totaling 19,000 square feet would alter the spatial organization and configuration of the Island parking lot. The number of car parking spaces would be reduced by approximately 200 to accommodate the building, bus turnaround, and associated public outdoor spaces. The parking lot is considered to be the Parkway terminus and there would be a loss of historic material and character-defining features such as original curbing, planting islands, and trees. Applying the three guidelines previously mentioned to the proposed design would mitigate these impacts: use of compatible materials and colors in new building design to minimize the massive feeling of a building,

integrate new site elements such as planting and paving in a compatible way that respects the overall mature landscape of canopy trees, and retain the overall spatial character of the remaining parking area. As a result, the action would be considered an adverse effect and a long-term moderate impact. The impact is measurable and changes one or more character-defining features, but it does not diminish the integrity of the Colonial Parkway. It would continue to be a parking lot as well as a terminus of the Parkway, and the majority of the lot would be preserved.

Island Boat Dock on Back River and Access Trail

Another component of the multimodal transportation concept at Jamestown is the boat taxi and interpretive tour. The boat would not only provide the visitor a view of the Island from the water, but also offer the opportunity to provide interpretation programs on how the early colonists and American Indians utilized the water and natural resources. The proposed location of the new boat landing and access trail would be screened from views of the surviving undeveloped character of the Island edge from other locations and overlooks on the Colonial Parkway. The addition of a connecting pedestrian trail to the Island parking lot would require selective cutting of a few trees, but it would not impact the overall character of the parking lot. Its impact on the larger Parkway landscape would be at the lowest level of detection. Therefore, this action would be considered a no adverse effect and a negligible impact.

Boat Dock and Access Trail at Powhatan Creek Overlook

The third and final stop in the boat ride, the Powhatan Creek Overlook, provides a key pedestrian/bicycle connection to the Glasshouse area and the Jamestown Settlement. This area is a steep bluff and would require skillful grading and layout of the dock and trail to avoid major

grading changes. Mitigation measures such as new grading following existing contours would minimize impacts on the surviving historic landforms of this steep area. Additional screening using fast growing evergreens such as bayberry would help hide the trail from the Overlook. Screening the dock with marsh vegetation would be considered a mitigation effort to minimize the visual impacts from the Powhatan Creek Bridge and the Parkway on the isthmus. With these mitigation measures, this action would be considered a no adverse effect and negligible impact on the Parkway landscape.

Modal Transfer at Powhatan Creek Overlook

This transfer stop picks up and drops off visitors using the shuttle, providing them the option of visiting Jamestown Settlement and the Glasshouse area or riding the water taxi to the Island or Neck of Land. Visitors would follow the hike/bicycle trail through the Glasshouse site to access the Settlement grounds. Keeping the shelter/structure as low profile as possible and retaining the existing circulatory pattern would mitigate the impacts and result in a no adverse effect and a long-term, minor impact. The structure could be removed anytime and is therefore considered temporary. Because the curbs have been previously repaired and replaced, any curbing alterations would not remove historic fabric.

Island Access/Entrance Booths

This alternative retains the Ranger Entrance Station but removes the entrance booths and their adjacent landscape features. The removal of the booths and the vegetated islands changes the spatial character and traditional use of the area as a formal entry into Jamestown Island. However, these structures have replaced the original single gatehouse from 1957 and therefore have been designated non-contributing elements to the Colonial Parkway landscape. It would therefore be considered a no adverse effect and a minor impact to the Parkway landscape.

Effects of Alternative C

Old Towne

Dale House Renovation

Proposed changes to the Dale House in Alternative C are the same as those discussed under Alternative B; therefore the impacts and determinative of effect would be the same. Overall changes would constitute a long-term, beneficial impact, as it would provide an essential new visitor service on Jamestown Island and allow for the removal of the existing temporary food shack that is adjacent to the Dale House, an existing impact on the commemorative landscape. Changes to the site would be minimal, give opportunity for much needed site rehabilitation, and add overall quality to the entire design concept plan. This would constitute a no adverse effect, and impacts to the historic structure and its landscape would be long-term and minor.

New Towne

Rehabilitation of the Existing Visitor Center as the New Observation Building

As in Alternative B, the existing Visitor Center and surrounding area would be modified to create the proposed Observation Building. Impact would therefore be the same as described under Alternative B: no adverse effect and a negligible impact to the interpretive landscape.

Neck of Land/Colonial Parkway

New Visitor Center, Intermodal Transportation Terminal, NPS Museum Collections, and Parking Lot at Neck of Land

The intent of this alternative is to remove the majority of the substantial facilities off the Island landscape and onto Neck of Land, providing the visitor with multiple options for education and alternative methods of transportation to the Glasshouse and the Island. Due to the increased amount of square footage from Alternative B, the

new facilities would have a greater impact on viewsheds from the Parkway. All new facilities, including the 300-car parking lot and access drives, would impact the historic landscape character of the Parkway. Because of its larger size, the building of a new facility and its associated parking area would require the removal of more forested vegetation than in Alternative B. The facilities would be placed as far south on the parcel to retain as much of the existing wooded buffer as possible, while not intruding into the 100-foot RPA adjacent to the Neck of Land marsh. The size of the parking lot would necessitate that it be built into one of three open areas found along this stretch of the Parkway, as in Alternative B. The additional 50 cars would be located at the western end of Neck of Land and would not be seen from the Parkway. The early 20th century log cabin ruin would have to be removed to accommodate the additional parking. It has been determined to be a non-contributing feature and its removal would not impact the Neck of Land cultural landscape.

Two design intents of the Parkway are contradicted by this development in the same way as Alternative B. One is that all modern development should be screened from the roadway. The other is that there is a sequence of spatial changes defined by vegetation or views along the entire stretch of roadway. In this section of the Parkway, the spatial character of the Parkway edge changes with a series of open lawn areas bordered by woods. The parking lot would be seen from the Parkway in the middle open area, which is 100 hundred feet deep and 450 feet wide. To mitigate this effect, the parking lot must be screened. A total width of 90 feet of area remains from parking lot edge to the Parkway pavement edge. A required 15-foot setback as clear zone along the Parkway reduces the total available area for wooded vegetative screening to 75 feet. This buffer would provide a screen for the parking lot during the winter season. The 0.55-acre area would be forested with the same mixed deciduous/evergreen biotic community found on site.

As a result, the spatial edge of the Parkway would change perceptibly by the removal of one of the three open areas, a character-defining feature. However, the rhythm of the open/enclosed sequence remains as you pass through this stretch of land because the surrounding areas remain unchanged. Therefore, the filling of the one open area to successfully screen the parking lot is considered a no adverse effect and a long-term, moderate impact.

As in Alternative B, current traffic data analysis recommends that in order for visitors to safely turn into Neck of Land from the Parkway, the Parkway pavement must be widened a minimum of 20 feet to accommodate turning lanes. This is a departure from Parkway design standards and constitutes a deviation in traditional design. Mitigation measures would be to design a divided island using compatible materials based on original traffic divider design such as the granite block pavers at the Route 359 intersection. In addition, the widening of the pavement would be done in a way that would be carefully integrated into the Parkway alignment. As a result, this action would be considered an adverse effect and a long-term, moderate impact to the Parkway landscape. By having a unique intersection in a new area, the Parkway is altered in a way that changes its character-defining features, yet the Parkway integrity remains.

In addition to impacts on the Parkway, the location of the access road for the Neck of Land facilities would remove 90 linear feet of the old Route 31 road trace, which is a contributing feature for the Neck of Land area. The removal of historic fabric is an adverse effect; however it is a very small portion of the entire road trace, which would remain intact. Minimal removal would not diminish the integrity of the historic road trace; therefore the impact is long-term and moderate.

Boat Dock and Access Trail to Intermodal Transportation Terminal

As in Alternative B, the construction of a new path and boat dock would result in the loss of historic vegetation. The current proposed location of the boat dock and Intermodal Transportation Terminal would not be seen from the Parkway and would not be considered an adverse effect on the Parkway. It would be considered a minor impact to the cultural landscape of Neck of Land because the removal of vegetation would be a measurable change when considering the cumulative impact on vegetation from the Neck of Land facility improvements.

Colonial Parkway

Small Ticketing Facility in Existing Island Parking Lot

Compared to Alternative B, Alternative C has a much smaller building program on the Island, and the parking lot would be reconfigured to accommodate a small ticketing facility along with 50 cars and 7 buses. The Island parking lot is considered to be the Parkway terminus and the loss of historic material and character-defining features such as original curbing and plantings needs to be minimized by applying the three guidelines previously mentioned for proposed design: use compatible materials and colors in new building design to minimize the feeling of a building, integrate new site elements such as planting and paving in a compatible way that respects the overall mature landscape of canopy trees, and retain the overall spatial character of the remaining parking area. As a result, the action would be considered an adverse effect and a moderate impact. The impact is measurable and changes one or more character-defining features but does not diminish the integrity of the Colonial Parkway. It would continue to function as a parking lot, and most of the lot would be preserved.

Island Boat Dock at Back River and Access Trail

This component of Alternative C would have the same impacts as discussed under Alternative B. It would therefore be considered a negligible impact to the Parkway landscape.

Hike/Bike Trail on Existing Parkway Alignment

This action would require no additions or improvements so there would be no impact to the Parkway or its landscape.

Boat Dock and Access Trail at Powhatan Creek Overlook

This component of Alternative C would have the same impacts as discussed under Alternative B. It would therefore be considered a negligible impact to the Parkway.

Modal Transfer at Powhatan Creek Overlook

This component of Alternative C would have the same impacts as discussed under Alternative B. It would therefore be considered a minor impact to the Parkway.

Island Access/Entrance Booths

Alternative C retains the Entrance Ranger Station as well as the entrance booths and their surrounding landscape features. There would be no change to these structures and therefore no impact to the Colonial Parkway landscape.

Effects of Alternative D

Old Towne

Under Alternative D, there would be no other actions on the APVA property other than those described under "Impacts Common to the Action Alternatives." The Dale House would retain its current functions as workspace/exhibit space for the APVA. The exterior would continue to offer some shade, limited seating, and beautiful vistas across the James River; however the Carrot Tree food service trailer would remain as an intrusion on the commemorative landscape.

New Towne

Combined Visitor Center, NPS Museum Collections, and Observation Building

Alternative D retains all operating and interpretive functions in an expanded facility at the existing Visitor Center site. As in Alternatives B and C, the changes include landscape alterations around the building. The removal of the amphitheatre, monument plaza, retaining wall, and trees would be included in the plans. As described in the "Impacts Common to the Action Alternatives," removal or reconfiguration of these public spaces would be considered a no adverse effect on the Mission 66 design because it is removing construction materials and spatial design aspects that have been altered since 1957, the period of significance. Although the building would increase in size and height, views of it from New Towne and Old Towne would remain partially obscured due to the preservation of existing mature pecan, loblolly, and sycamore trees. It therefore would be considered a no adverse effect and a minor impact to the interpretive and commemorative landscape.

Colonial Parkway

Hike/Bike Trail on Existing Parkway Alignment

As in Alternative C, this action would require no additions or improvements so there would be no impact to the Parkway or its landscape.

Access to Island/Entrance Booths

Similar to Alternative C, this alternative retains the Entrance Ranger Station as well as the entrance booths and their adjacent landscape features. There would be no adverse effect or impact to the Parkway or the structures.

Effects of Alternative E

Old Towne

Dale House Renovation

In Alternative E, the Dale House would become a lounge/reception center for volunteers and donors to the APVA and NPS. APVA administration and artifact processing would be transferred to the existing Jamestown Rediscovery™ Center. The current exhibits would be shown in secured cases and made to fit with the reconfigured interior. The center section would be fitted with seating, climate control, and vending type refreshments (delivered in sealed packaging, not requiring onsite preparation). Impacts to the historic structure would occur only on the interior and would be minor. The temporary food shack that serves visitors with refreshments and light fare would also remain as part of the Dale House site and continue to visually impact the commemorative landscape.

New Towne

Rehabilitation of the Existing Visitor Center as the New Observation Building

As in Alternatives B and C, the existing Visitor Center and surrounding landscape would be reconfigured to create the proposed Observation Building. Under Alternative E, the new facility would be smaller than that proposed in Alternatives B and C (2,500 square feet versus 5,000 square feet, respectively). However, impacts would remain the same: a no adverse effect and a negligible impact to the surrounding interpretive landscape.

Neck of Land/Colonial Parkway

Intermodal Transportation Terminal and Parking Lot at Neck of Land

As in Alternative B, this area would be the main hub to the multimodal concept for Jamestown. Facilities in this location would orient the visitor

to Jamestown and provide them with information to make their stay more interesting. Parking for 100 cars would be available, and a shuttle service would be provided for those visitors who do not want to walk, bicycle, or ride the boat to the Island. The building size would be the same scale as proposed in Alternative B, and would not be a visual impact from the Parkway. As proposed, the new development would remove less forest area than Alternatives B and C. However, it would still require the need to fill in the middle open space along the Parkway with a forested buffer.

Like Alternatives B and C, two design intents of the Parkway are impacted by this development. One is that all modern development should be screened from the roadway. The other is that there is a sequence of spatial changes defined by vegetation or views along the entire stretch of roadway. In this section of the Parkway, the spatial character of the roadway edge changes with a series of open lawn areas defined by woods. The parking lot would be seen from the Parkway in the middle open area, which is 100 hundred feet deep and 450 feet wide. To mitigate this effect, the parking lot must be screened. A total width of 90 feet of area remains from parking lot edge to the Parkway pavement edge. A required 15-foot setback as clear zone along the Parkway reduces the total available area for screening to 75 feet. This wooded buffer would provide a screen for the parking lot during the winter season. The 0.55-acre area would be forested with the same mixed deciduous / evergreen biotic community found on site.

As a result, the spatial edge of the Parkway would change perceptibly by the removal of one of the three open areas, a character-defining feature. However, the rhythm of the open/ enclosed sequence remains as you pass through this stretch of road because the surrounding areas remain unchanged. Therefore, the filling of the one open area to successfully screen the parking lot is considered a no adverse effect and a long-term, moderate impact.

As in Alternatives B and C, current traffic data analysis recommends that the Parkway pavement must be widened a minimum of 20 feet to accommodate turning lanes. This is a departure from Parkway design standards and constitutes a deviation in traditional design. Mitigation measures would be to design a divided island using compatible materials based on original traffic divider design such as the granite block pavers at the Route 359 intersection. In addition, the widening of the pavement would be done in a way that would be carefully integrated into the Parkway alignment. As a result, this action would be considered an adverse effect and a long-term, moderate impact to the Parkway landscape. It alters the road in a way that changes character-defining features by having a unique intersection in a new area. The action would not, however, diminish the integrity of the Parkway.

In addition, the location of the access road to the Neck of Land facilities and parking lot would remove 90 linear feet of the old Route 31 road trace, which is a contributing feature to the Neck of Land cultural landscape. The removal of historic fabric is an adverse effect, but only a very small portion of the entire road trace would be removed. Because the majority of the road would remain intact, it does not diminish the integrity of the historic road trace, and its removal is therefore a long-term, moderate impact.

Boat Dock and Access Trail to Intermodal Transportation Terminal

As in Alternatives B and C, the dock at Neck of Land would be the initial point to begin the interpretive water tour. Impacts from the dock and access trail would be the same as those described under Alternative B: it would not be considered an adverse effect on the Parkway. It would also be considered a minor impact to the cultural landscape of Neck of Land because the removal of vegetation would be a measurable change when considering the cumulative impact on vegetation from the Neck of Land facility improvements.

Hike/Bicycle Path over the Neck of Land Marsh to Powhatan Creek Overlook

Part of the multimodal system, the hike/bicycle path would connect Neck of Land with the Powhatan Creek Overlook, which in turn connects to the Glasshouse and Jamestown Settlement. The section of trail leading through the Neck of Land forest would be hidden, but its alignment through the marsh and the connecting bridge over Powhatan Creek would be considered an adverse effect on the Parkway viewshed. The trail bridge would be seen crossing the river from the Powhatan Creek Bridge on the Parkway. There is no forested vegetation to provide a visual buffer of the bridge, which must be approximately 14-14.5 feet above mean high tide to allow for safe passage of boat traffic beneath. Designing the bridge with compatible materials using natural colors would minimize the overall visual impact from a distance. In addition, constructing the trail in the forested areas of Neck of Land would result in the potential loss of vegetation. Locating the trail in a way that minimizes tree cutting would be considered a mitigative measure. This trail system would be considered a long-term, moderate impact on the Parkway and Neck of Land cultural landscapes.

Colonial Parkway

Replacement Visitor Center/Education Facility at Existing Island Parking Lot

Alternative E proposes a replacement Visitor Center/Education Facility, bus drop-off, and reduced parking as in Alternative B, therefore the determination of effect and impacts would be the same as described under Alternative B. This action would be considered an adverse effect and a moderate impact because the impact is measurable and changes one or more character-defining features, but it does not diminish the integrity of the Colonial Parkway. It would continue to function as a parking lot, and most of the lot would be preserved.

Island Boat Dock at Back River and Access Trail

This component of Alternative E would have the same impacts as discussed under Alternatives B and C. The location of this boat dock and the access trail to the Jamestown Island parking lot would be considered to have no adverse effect to the Parkway because it cannot be seen from the Parkway along the isthmus. It would therefore be considered a no adverse effect and a negligible impact to the Parkway.

Modal Transfer at Powhatan Creek Overlook

This action would be the same as proposed in Alternatives B and C, therefore impacts related to this Alternative E action would be the same as those described under Alternative B: a no adverse effect and a long-term, minor impact.

Access to Island/Entrance Booths

As in Alternative B, this alternative retains the Entrance Ranger Station but removes the entrance booths and their surrounding landscape features. The removal of the booths and the vegetated islands would change the spatial character and traditional use of the area as a formal entry into the Island. However, these structures have replaced the original single gatehouse from the 1957 era and therefore have been designated non-contributing elements to the Colonial Parkway landscape. It would therefore be considered a no adverse effect and a minor impact to the Parkway landscape.

Cumulative Impacts

Cumulative impacts to identified cultural landscapes would result from the new construction at Jamestown Settlement, the modification of the connection of the Colonial Parkway with the realignment of Route 359, increases in private development along the Parkway, and increases in visitation due to the upcoming 400th anniversary commemoration in 2007. Overall, cumulative impacts could represent a long-term, major adverse impact to the identified landscapes, in particular the Colonial Parkway; however, these impacts can be

mitigated. Adjacent construction and development impacts would be mitigated through purchase of additional scenic easements along the Colonial Parkway and increased vegetative screening within easements and along property boundaries. Design of the modified intersection would be in keeping with the original intent of the Parkway design and compatible materials would be used for construction. Increased visitor use impacts, which could result in overuse and degradation of contributing landscape features would be mitigated through interpretive and educational programs, which would increase visitor appreciation of these resources and how they are preserved and managed.

Conclusion

Jamestown Island, including the Colonial Parkway and Glasshouse Point, is a large-scale, designed landscape. Its individual features collectively contribute to the overall character of the landscape, but these features may or may not individually be considered as eligible for listing on the National Register. Therefore, if some features are altered or removed and documented, they do not necessarily adversely change the basic character of the landscape. Cumulatively, however, there is a threshold in which if too many of these features are removed or changed then the larger landscape's unique character may diminish. None of the action alternatives propose anything that would cause this condition to occur.

Irreversible/irretrievable actions are development actions that would result in removing either the Colonial Parkway or Jamestown Island from the National Register of Historic Places. Although there are many adverse effects described in the alternatives, mitigation measures reduce the effects within the identified landscapes. In all alternatives, the cumulative impacts do not result in irreversible or irretrievable actions. Also, because none of the overall impacts have been identified as major and thus contributing to the removal of a resource from the National Register, none of the action alternatives would result in impairment to cultural landscapes, a valuable park resource.

Table 4-4 summarizes the impact intensities on cultural landscapes for each of the alternatives, including Alternative A, the No Action Alternative. In addition, the overall impact of each alternative on the identified cultural landscapes is briefly summarized below.

Alternative A (No Action Alternative)

The No Action Alternative has the least overall impact to the cultural landscapes. No new areas would be open to development, and there would be no significant change to the interpretive or commemorative landscapes. The *Cultural Landscape Report* (OCULUS 2002) will provide the determination of historically significant features and develop a treatment plan to protect and preserve those features. However, the greatest impact to the cultural landscape in this alternative is the consistent erosion of funding which cumulatively results in negligible impacts. There is a major reduction in maintenance staffing levels to preserve and maintain existing features¹. Implementation of the treatment plan would depend on future funding.

Because no construction or development is planned, there would be no adverse effect to the Colonial Parkway, Mission 66, or commemorative landscapes. Historic plant material, historic road traces, circulation systems, and building complexes and interpretive features would remain intact. The overall impact would be negligible.

Alternative B

Collectively, the changes to Powhatan Creek Overlook and Glasshouse Point, the new facilities at Neck of Land, the addition of a hike/bicycle trail over the marsh, and the reconfiguration of the parking lot result in minor or moderate impacts to the Colonial Parkway after mitigation.

¹ The description of existing operations and the impact of the proposed alternatives on both APVA and NPS operations is discussed in Sections 3.6 and 4.6, respectively.

Table 4-4: Summary of Cultural Landscape Impacts					
	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Colonial Parkway: Entrance to Neck of Land Facilities	No Impact	Moderate	Moderate	No Impact	Moderate
Colonial Parkway and Neck of Land: Neck of Land Facilities	No Impact	Moderate	Moderate	No Impact	Minor
Colonial Parkway: Powhatan Creek Overlook Boat Dock and Modal Transfer	No Impact	Minor	Minor	No Impact	Minor
Colonial Parkway: Access to Island/Entrance Booths	No Impact	Minor	No Impact	No Impact	Minor
Colonial Parkway and Neck of Land: Hike/Bicycle Trail	No Impact	Negligible	No Impact	No impact	Moderate
Colonial Parkway: Island Parking Lot and Boat Dock	No Impact	Moderate	Moderate	No Impact	Moderate
Commemorative Landscape	Negligible	Moderate	Minor	Minor	Minor
Mission 66: Glasshouse Point	Negligible	Minor	Minor	Minor	Minor
Mission 66: New Towne	Negligible	Negligible	Negligible	Negligible	Negligible
Mission 66: Loop Drive	Negligible	Negligible	Negligible	Negligible	Negligible
Overall Impact	Negligible	Minor to moderate	Moderate	Negligible to minor	Minor to moderate

The additions of the NPS curatorial building, the Ludwell exhibit facility, expanded parking adjacent to the Jamestown Rediscovery™ Center, and the modifications at the Dale House are minor to moderate impacts to the commemorative landscape. Changes to the Mission 66 landscape at the Visitor Center are minor impacts because the terrace and ramp adjacent to the Visitor Center were reconfigured during the 1970s.

Alternative C

The scale of development at Neck of Land and the alignment of the hike/bicycle trail define the key difference of Alternative C. Almost all parking is taken off the Island and placed at Neck of Land. The Visitor Center, NPS curatorial storage, and the Intermodal Transportation Terminal would cover a greater percentage of land, thereby impacting more of the landscape. Collectively the changes to the

Powhatan Creek Overlook, the new access to Neck of Land, and the reconfiguration of the Island parking lot are considered to be moderate impacts to the landscape with mitigation.

The expanded parking lot, Ludwell exhibit facility, and modifications at the Dale House are considered minor impacts to the commemorative landscape on APVA property. Impacts to the Mission 66 landscape at the Visitor Center would be minor because the terrace and ramp adjacent to the Visitor Center were reconfigured during the 1970s.

Alternative D

This alternative would have the least impact on the cultural landscape of all the action alternatives. Overall, the level of impact in this alternative is negligible to minor, in particular with respect to the Colonial Parkway. There would not be any

development on Neck of Land and the hike/bicycle trail uses the existing Parkway paving. There are no boat docks or modal stop at Powhatan Creek.

The existing trees surrounding the Visitor Center would screen the visual impact of the proposed expansion on the Mission 66 landscape. The expanded parking lot and the Ludwell exhibit facility are considered minor impacts to the commemorative landscape on APVA property.

Alternative E

Collectively the changes to the Powhatan Creek Overlook, the new access to Neck of Land, the addition of a hike/bicycle trail over the Neck of Land marsh and Powhatan Creek, the addition of a replacement Visitor Center in the Island parking lot, and reconfiguration of that lot are considered to be minor to moderate impacts that can be mitigated to minimize their effects on the Colonial Parkway and Neck of Land cultural landscapes.

The expanded parking lot and the Ludwell exhibit facility are considered minor impacts to the commemorative landscape on APVA property. Impacts to the Mission 66 landscape at the Visitor Center would be minor because the terrace and ramp adjacent to the Visitor Center were reconfigured during the 1970s.

4.3.1.5 Archives and Collections

The Jamestown collection contains objects that survive from Jamestown's past. Of Jamestown's 17th century buildings, only the Church Tower stands; of previous American Indian structures, nothing remains above ground. The collections, the things actually made and used by the many generations who have occupied the Island, and the archives, which document and support the collections, are therefore especially important, as they are what is left to be seen and studied of the "real" Jamestown.

The mandate of both the APVA and NPS on Jamestown Island is to preserve its heritage and inform the public about that heritage. The archives

and collections document Jamestown's history, providing primary, first-hand evidence for researchers, staff, and visitors. The archives and collections must be protected, preserved, and made accessible for research and interpretation. All development alternatives for Jamestown Island must ensure protection of the collections and archives and facilitate their use. In fact, improving facilities for the collections is one important reason for the changes proposed by the Jamestown Project Development Concept Plan (DCP).

Because both the APVA and NPS must keep the historic record in perpetuity, each is motivated to find and follow effective methodologies for the storage, security, and management of the collections in its care. The APVA, a private organization, and the NPS, a federal agency, address shared goals of preservation, conservation, and curatorial excellence through standards and guidelines specific to each organization (Table 4-5).

Under each proposed development alternative these standards and guidelines inform the assessment of impacts on the collections and archives. The "Archives and Collections" section in "Chapter 3: Affected Environment" provides background information on the current condition and needs of the archives and collections addressed by the different action alternatives.

An additional consideration in the evaluation of the collections alternatives is the desire of both responsible entities to allow their individual holdings to be jointly accessible to researchers and the public. Keeping the two collections in the same building has in the past minimized the artificial distinction between the two collections caused by land ownership. The recent division of the collections, separated when the Jamestown Rediscovery™ Center became operational, has benefited preservation of the APVA's artifacts but has made concurrent use of the two collections more difficult.

Table 4-5: Collections Guidance Documents

Agency	Document	Description	Citation
APVA	APVA Collections Policy	Policy and procedure for the administration, preservation, record keeping, and use of APVA collections.	Association for the Preservation of Virginia Antiquities, Richmond, Virginia, 1993.
APVA	Code of Ethics for Museums	Nationally-recognized professional guidelines for museum management	American Association of Museums, 2000.
NPS	Curation of Federally-owned and Administered Archaeological Collections	Government-wide regulations for the curation and care of federal archaeological collections.	36 CFR 79
NPS	Automated National Catalog System (ANCS+) User Manual.	Guide to operating the NPS software program (ANCS+) for accessions, de-accessions, cataloging, loans, searches, reports, artifact images, forms, and other museum functions.	Washington, DC: National Park Service, 1998.
NPS	Colonial National Historical Park Collection Management Plan Update	An assessment of a park's museum collection management program to identify problems and make recommendations to improve the care of the collection.	Boston, MA: Northeast Museum Services Center, National Park Service, 1999.
NPS	Conserve-O-Grams	Technical leaflets with updated information to guide and assist park staff in carrying out projects identified in collection management planning documents.	Washington, DC: National Park Service, 2001.
NPS	Cultural Resource Management Guideline (DO-28).	A handbook for implementing park management standards and other requirements consistent with federal law and regulation as it applies to cultural resources.	Washington, DC: National Park Service, 1998.
NPS	Floodplain Management: Revised Guidelines, Special Directive 93-4.	Provides agency guidance for floodplain management and minimizing potentially hazardous conditions associated with flooding.	Washington, DC: National Park Service, 1993.
NPS	Management Policies 2001	A summary of the basic, service-wide policy documents of the National Park Service.	Washington, DC: National Park Service, 2000.
NPS	Museum Collections Management (DO-24)	NPS guidelines for collections management.	Washington, DC: National Park Service, 2000.
NPS	NPS Museum Handbook. Part I (Museum Collections), Part II (Museum Records), and Part III (Museum Collections Use).	Policy and procedure for the administration, preservation, record keeping, and use of museum collections.	Washington, DC: National Park Service, 2001.
NPS	Survey of Museum Collection Security and Fire Safety, Colonial National Historical Park.	An examination of exhibit and storage facilities and emergency plans, and a summary report of the most significant findings with recommendations for improving security against threats both natural and human.	Conducted by Danny L. McDaniel. Williamsburg, VA: Colonial Williamsburg Foundation, 1992.

All of the proposed development alternatives reflect APVA administrative policy. The APVA, in a letter dated March 9, 2001, reaffirmed its strong commitment to keeping its portion of the Jamestown collection on Jamestown Island. The Association believes that the artifacts must be closely connected to the resource and to the place of their recovery, for the benefit of scholars and researchers and for protection of the artifacts. Thus all proposed alternatives retain the APVA collection within the Jamestown Rediscovery™ Center on Jamestown Island.

Methodology

The NPS provides mandated guidelines for the administration and preservation of its archives and museum collections in numerous publications (Table 4-5), including the *Museum Handbook* (NPS 2000e) and the *Cultural Resource Management Guideline* (NPS 1997a). These guidelines are harmonious with nationwide policies of the American Association of Museums, of which the APVA adheres to. Collections must be preserved, protected, and used judiciously for research and exhibit. Jamestown's collection is especially unique because, unlike later periods of American history, there are fewer written records, thereby making artifacts and their associated documentation even more valuable for interpreting the site. Because it is an APVA and NPS mandate to retain this historic record in perpetuity, requirements for staffing, storage facilities, and exhibit are specific. Requirements include, but are not limited to, controlled access by authorized staff only; climate control; integrated pest management; structures that comply with standards for safety, security, and fire protection (both detection and suppression) with locations outside threatening environments such as floodplains; adequate space; proper storage containers; emergency planning; monitored research use; and exhibit safeguards.

Extensive record keeping, which is reported annually by the NPS to the Washington Office of the Museum Management Program, is required of NPS curators to assure compliance with these standards

and to document archives and museum objects. In order to qualify the impacts of the alternatives on the Jamestown collection (both the APVA and NPS portions), the following intensity definitions will be used:

Negligible: The impact on archives and collections is at the lowest level of detection, barely perceptible and not measurable.

Minor: The impact on archives and collections is measurable or perceptible, but it is slight and localized. The object remains in stable condition and does not require conservation treatment if it remains in a secure, climate-controlled environment. The impact does not affect the integrity or historical value of the object, nor does it diminish its potential as an exhibit item.

Moderate: The impact on archives and collections is measurable and perceptible, with adverse long-range implications. Deterioration of objects is inert in a climate-controlled environment, but agents of deterioration are activated quickly by destabilizing features such as electrical power failures. The impact has the potential to affect the integrity or historical value of the object, and conservation treatment is required if the object is placed on exhibit, used extensively for research, or receives extensive exposure in other ways.

Major: The impact on archives and collections is substantial, noticeable, and permanent. Damage is severe, with partial or total loss of the object. Further deterioration is retarded in a climate-controlled atmosphere, but agents of deterioration remain active and continue to erode the object, even without electrical power failures. The impact is so adverse that the integrity and historical value of the object is almost nullified, and conservation treatment salvages the remainder of the item instead of restoring it. Usefulness as an exhibit item likewise is lost.

Overall, storage facilities and exhibit areas should maintain such high standards that adverse impacts on archives and collections are negligible. A facility that permits minor adverse impacts has signs of imperfections that need correction. If adverse impacts are moderate, the damage, or potential for damage, is exceeding the approved limits. Major adverse impacts are unacceptable, as they destroy the resource that the facility is intended to preserve.

APVA Collection

As described in the “Archives and Collections” section of “Chapter 3: Affected Environment,” APVA collections-related staff offices and the bulk of the APVA portion of the Jamestown collection are located in the historic Yeardley House (now called the Jamestown Rediscovery™ Center) on Jamestown Island. The Yeardley House was extensively remodeled in 1999 to provide the APVA with a modern collections and archives facility. Preparation of artifacts for storage (as well as exhibition of a few artifacts) occurs in the Dale House, a separate building located a few hundred yards from the Jamestown Rediscovery™ Center. Although the Dale House and Jamestown Rediscovery™ Center meet many professional standards for collections processing (the preparation of objects for storage) and storage, some further improvements to access roads and fire protection of collections are needed for full compliance with applicable guidelines.

NPS Collection

Also in “Chapter 3: Affected Environment,” NPS collections-related staff offices, collections processing, and the bulk of the NPS collections are located in the Visitor Center basement on Jamestown Island. In addition, a limited number of artifacts are displayed on the first floor of the Visitor Center. The collections area was built as a modern facility in 1957, had minor remodeling in 1976, and has had limited improvements to upgrade building systems since its initial construction. The basement area no longer meets professional standards for collections facilities due to deteriorating building systems and more stringent standards for collections management.

Effects of Alternative A (No Action)

The effect of the No Action Alternative on the Jamestown collection and its use is extensive and detrimental and is a major reason for the proposed action alternatives. Although each collection is at risk of physical damage under Alternative A (No Action), there are significant differences for each collection. Physical threat is minimal to the APVA collection while serious and immediate to the NPS collection. These effects are detailed below under the listing specific to each collection.

In addition to physical risk to both collections, use of the collections for research and public education is also an issue under Alternative A (No Action). The value of the Jamestown collection would remain diminished by being split in two different places. For example, separation of the APVA and NPS collections would continue the current disjointed and confusing situation for researchers who often are not aware which organization holds the materials they wish to examine. Two collections must be searched rather than one. Separation in individual facilities inflicts an artificial barrier on the material culture of Jamestown that can result also in imperfect and incomplete interpretation because researchers cannot examine the objects from both collections simultaneously or do not realize that the other entity might hold a similar object.

For the most part, the holdings of the APVA and NPS can be categorized as “fort period” material (APVA) and “New Town” material (NPS); however, they are not mutually exclusive. For example, APVA’s Jamestown Rediscovery™ Project has uncovered hundreds of objects relating to the first glassmaking attempts circa 1608-10. NPS has hundreds of objects related to glassmaking from the excavations at Glasshouse Point. In order to tell the whole story of glassmaking at Jamestown, material from both collections should be examined simultaneously. Old interpretations may change when considered in the light of the evidence uncovered by the more recent excavations. Another example is Structure 163, which straddles the

APVA-NPS property line. Believed to be the 1640s foundation of a warehouse belonging to merchant John White, “it symbolizes Jamestown’s evolution from military camp of the first years of settlement to commercial river port/Virginia capital in the second quarter of the 17th century” (Kelso et al. 1999). The site and its associated objects must be analyzed as one entity even though the Island and its artifacts are owned by two organizations. It is a shared resource.

APVA Collection

Under Alternative A (No Action), there would be no immediate impacts to the APVA collections and archives. Having separate buildings for the processing and storage of artifacts is workable since both are located close to the archaeological excavations. Continuing excavations on the property would eventually necessitate an expansion of the existing 1,700 square feet of storage space. At the present rate of adding 50,000 artifacts per year, this need would be evident within the next 6 to 8 years.

The Jamestown Rediscovery™ Center has no fire suppression system. Current plans to install a sprinkler system connected to the municipal water main would bring fire protection into compliance with museum standards.

While the condition of the APVA collection is excellent, housing other items (photography studio and collection, map collection, computer server) in the same area compromises the security of the collection vault. The best museum practice for security is to limit and closely monitor access to collection storage areas.

NPS Collection

Alternative A threatens the physical safety of the NPS portion of the Jamestown collection. The museum storage space has poor drainage patterns and is also within the 100-year floodplain. Heavy rains and nor’easters have flooded the basement on several occasions. Inadequacies in electrical service, building design, and HVAC systems would

continue to support potential mold and mildew growth. In addition, pipes and mechanical systems are located within the collection storage area. Limited space within the Visitor Center building requires that supplies and materials be stored within the collection area as well. These ancillary functions housed within the storage area pose an ongoing risk of damage and contamination to archives and collections.

Storage within the facility is currently at capacity. Continued archaeological excavations, internal production of archival material, and donations would increase the size of the NPS portion of the Jamestown collection even further beyond the existing building’s storage capacity.

Overcrowding in the NPS staff office, which also must accommodate researchers and contract catalogers, would become worse with the anticipated increase in collection use as 2007 approaches. Currently, only one or two people at a time can research the collections, and that is only accomplished by displacing staff.

Under Alternative A, exhibit space remains limited, depriving visitors of the opportunity to view more than a very small sample of the NPS collection.

During the period 1957-2001, the adverse impact upon the collections was negligible since climate control and security were maintained and quick response by the staff thwarted potential flooding on several occasions. However, the lower level of the building, which provides collection storage and contains heating, ventilation, and air-conditioning (HVAC) equipment, would remain in the 100-year floodplain, and the upper level would remain surrounded by the 500-year floodplain. Incoming water would threaten collections on the lower level, and a leaky roof or mold growth caused by prolonged power outages could damage exhibits on the upper level. There is considerable potential for irreversible damage to the collection, making the risk assessment major as conditions deteriorate.

Impacts Common to the Action Alternatives

New, improved, and expanded exhibits are anticipated to be included under all action alternatives, as called for in the *Jamestown Island Interpretive Plan* (Haley Sharpe Design 2001b). This would have a beneficial impact on visitor education and enjoyment. These exhibits would include objects from both the APVA and NPS collections and archives. Provision of suitable environmental controls, fire and flood protection, and security for displayed objects would be necessary to protect the collection. Where protection of collection items cannot be provided, other display and interpretive techniques must be used so that collection objects would not be harmed and there would be no adverse impact to collections.

Effects of Alternative B

This is the only alternative that fulfills the organizational objective that both the NPS and APVA portions of the Jamestown collection be stored in the same building—an expanded Jamestown Rediscovery™ Center.

In Alternative B, artifact processing, treatment and study would be performed in one location. A room for researchers, shared between the NPS and the APVA, would reduce space needs and better accommodate visiting scholars. Visiting researchers would benefit by being able to compare and contrast specific objects simultaneously. Objects would not need to be moved from one place to another for study, an action with operational, security and temperature/humidity considerations. Researchers would also be able to easily find similar objects held by both organizations even though he or she originally may only have known about the objects in one collection. Providing a shared facility for the resources would also facilitate special artifact studies and/or exhibits by the organizations' specialists.

The expanded facility, with joint processing space, equipment, and supply areas would benefit both collections. Having one destination for artifacts once

they are excavated would minimize the likelihood of loss or breakage of objects. With the concentrated attention of curators, conservators, and laboratory assistants, the material would be assured consistent attention. Communication between these specialists would also be more collaborative and immediate, facilitating knowledge transfer.

An expanded facility would also allow separation of photography studio, photographic and map archives, and server computers from collections storage areas. To administer and preserve the collection and enhance accessibility, separate office space would be provided at the Jamestown Rediscovery™ Center for such record keeping as accessions, loans, and other documentation, as well as cataloging. Space would be provided for both computer equipment and file cabinets because paper still remains the only stable source for preserving records. Additionally, with the expanded space, library documents that are currently stored elsewhere would now be more easily accessed and available to researchers.

While shared research facilities would provide visiting scholars the ability to study both the NPS and APVA portions of the Jamestown collection simultaneously, staff would need to closely monitor collection use to ensure that artifacts from each collection would not inadvertently be intermingled. Strict adherence to both APVA and NPS policies and procedures would be maintained in order to preserve the integrity of each collection and satisfy independent ownership requirements. Some concern has been expressed over locating the APVA and NPS collections in the same facility because the objects could be co-mingled, and because there could be a loss of organizational control over the collections. To address these concerns, a common operational plan covering these curatorial resources would be jointly developed in a Memorandum of Agreement by the curatorial staff of both organizations, to ensure that each collection be managed to its owner's specifications. Such a plan would specify ways to prevent inadvertent mixing

of the separate collections (especially when being simultaneously researched), would identify common emergency procedures to ensure protection of the two collections, and would clearly identify requirements for access to the collections. Prescribed measures could include Plexiglas dividers on research tables or digital photographs (before and after) taken of objects being researched together to document specific artifacts. Careful monitoring of researchers using the collections—as should be routinely practiced for security reasons alone—should be adequate to prevent misplacement of objects. APVA and NPS curators would be responsible for monitoring use and management of their respective collections.

Any expanded facility would meet or exceed the environmental, security, and safety requirements of each organization. The Jamestown Rediscovery™ Center is within the 100-year floodplain, although storage for the collection would be at a built level above the 500-year floodplain (above elevation 9.8 feet). The existing floor of the Jamestown Rediscovery™ Center is at elevation 10.15 feet. Recognizing the sensitivity of locating collections within the floodplain as established by the *Floodplain Management Guideline* (NPS 93-4), strong mitigation measures must be developed in order to protect the collections. This alternative would employ three complementary mitigation strategies:

- 1) Provision of structural flood-proofing of the addition to the Jamestown Rediscovery™ Center to ensure that no flooding of the collection storage area or from the area beneath the collection could occur.
- 2) Provision of HVAC, humidity, and security equipment and controls capable of maintaining a proper environment for the collections during worst-case flood conditions (i.e., being self-contained with generators, emergency supplies, etc.).

- 3) Development of an operational response plan for protecting the collections, facility, and staff during flooding.

The collection also would face such natural threats as nor'easters and hurricanes; all new construction would be designed to resist these conditions, as required by codes and as necessary to protect collections.

While the replacement Visitor Center/Educational Facility and the upper level of the Observation Building would be above the 500-year floodplain, the lower level of the Observation Building would be within the 100-year floodplain. Even if artifacts are only exhibited in the structure's upper levels, water at lower levels could adversely affect the atmosphere within the building as well as the mechanical systems that provide temperature and humidity control. Because only the "best" objects in a collection generally are displayed, one can reasonably assume that these prime artifacts would be at risk in such conditions. Structural protection provisions as outlined for the Jamestown Rediscovery™ Center addition and waterproofing of basement walls for proper drainage, as well as an operational plan setting up ways to evacuate objects during environmental catastrophes, would be required.

Archaeological materials recovered from excavations for new structures would have the short-term impact of immediately increasing the collection's size; therefore expanded storage space should accommodate these additional materials.

APVA Collection

Alternative B provides increased security to the APVA portion of the Jamestown collection by removing currently incompatible uses from the collections storage area and placing them in the new addition. Artifact processing space provided in the new addition, replacing the Dale House processing area, minimizes potential transit damage to objects. Alternative B also provides additional

environmentally controlled exhibit space in several locations throughout the project area and opportunities for related interpretation.

Under Alternative B, one of the areas where the Jamestown collection objects would also be displayed is in the Ludwell exhibit facility, thus improving the visitor experience. Because the building would be within the 500-year floodplain structural protection provisions and HVAC systems as outlined for the Jamestown Rediscovery™ Center addition, as well as an operational plan for evacuation of objects during environmental catastrophes, would be required as mitigation.

Moving collection items for exhibit purposes, especially iron artifacts, from the Jamestown Rediscovery™ Center's climate-controlled environment could be detrimental and should be carefully considered. Appropriate environmental controls and security measures are necessary in the new display areas.

NPS Collection

Alternative B provides increased protection to the NPS portion of the Jamestown collection by storing it above the 500-year floodplain in a modern building with museum environmental control systems. It removes incompatible uses from the collection storage area and provides separate artifact processing space. The new joint photo studio would enhance the NPS's ability to document and care for its collection. Increased storage area would help accommodate anticipated additions to the NPS collections.

As mentioned above under the "APVA Collection," Alternative B also provides several new attractive venues for NPS collection items to be exhibited and for related interpretation.

The safeguards for the Jamestown Rediscovery™ Center are well conceived; however, the archives and collections would remain surrounded by the 500-year floodplain, endangered by the

unpredictable forces of nature, which is a major risk. The replacement Visitor Center in the Island parking lot and the Observation Building would scarcely fare better since, like the Jamestown Rediscovery™ Center, an elevated level for artifacts would be their only advantages. Prolonged power outages would be possible at all three buildings, accompanied by mold growth and possible water damage from rising water or leaky roofs. Potential for damage at all three sites would be major.

Effects of Alternative C

Under Alternative C, the NPS portion of the Jamestown collection would be stored in a new facility on Neck of Land. This alternative does not meet the joint APVA/NPS objective of keeping the Jamestown collection in the same facility. The specific impacts of Alternative C are discussed below for each of the collections.

Separation of the APVA and NPS portions of the Jamestown collection would continue the current situation described under Alternative A (No Action), continuing to create confusion for researchers who would need to be educated how best to use the resources of each entity effectively. The use of the APVA and NPS collections for special artifact studies and/or exhibits by the organizations' specialists would remain cumbersome. The overall value of the Jamestown collection as a research and educational tool would continue to be diminished. Alternative C would not strengthen the APVA-NPS partnership by allowing curators from both organizations to work side by side.

Archaeological materials recovered from excavations for new structures would have the short-term impact of immediately increasing the collection's size; expanded storage space should accommodate these additional materials.

APVA Collection

Processing and conservation of artifacts would be moved to the Jamestown Rediscovery™ Center collection storage area with the renovation of the

Dale House as a lite fare café for visitors. This would negatively impact the security of the APVA collection by adding multiple activities within the secure collection storage area and could introduce dirt and contaminants in the storage area. The best museum practice separates collection storage from all other activities so that collection access can be closely monitored. Special construction to provide separation of areas would be required to mitigate these impacts. Placing the processing function in the Jamestown Rediscovery™ Center would eliminate one potential hazard by taking objects directly from the excavation site to the collections building, which would be a beneficial, but minor impact.

Under Alternative C, APVA collection objects would also be displayed in the Ludwell exhibit facility, improving the visitor experience. Because the building would be within the 500-year floodplain, structural protection provisions to prevent flooding of the exhibit area, HVAC humidity and security equipment and controls capable of maintaining a proper environment for collection objects would need to be provided as mitigative measures. An operational plan for evacuation of objects during environmental catastrophes would also be required as mitigation.

Since APVA objects would be exhibited in both the Ludwell exhibit facility and the Observation Building, movement of the objects, especially the iron artifacts, out of the climatically controlled environment of the Jamestown Rediscovery™ Center could be detrimental and should be carefully considered. Appropriate environmental controls and security would be required in the new display areas, as mentioned above.

NPS Collection

Alternative C provides increased environmental protection for the NPS archives and collections by removing the collections from the 500-year floodplain, to comply with *NPS Floodplain Management Guideline, 93-4*. Collections storage and some exhibits would be on Neck of Land in a

combination new curatorial storage facility, Intermodal Transportation Center, and Visitor Center. Proper museum environmental controls would eliminate current threats to the NPS collections from mold and mildew and would have a beneficial impact. However, only the NPS portion of the Jamestown collection would be stored here, separate from the APVA portion of the collection.

Even though it is above the 500-year floodplain, the site is subject to hurricanes and nor'easters. Surrounding trees on the site increase the potential for damage during windstorms. Protective measures would need to be developed in order to safeguard the collections. This alternative would require the following complementary protection strategies:

- 1) Construction of facilities to meet code requirements and as necessary to protect collections from strong winds and hurricane conditions.
- 2) Provision of HVAC and humidity and security equipment and controls capable of maintaining a proper environment for the collections during emergency conditions (i.e., being self-contained with generators, emergency supplies, etc.)
- 3) Development of an operational response plan for protecting the collections, facility, and staff during emergencies.

While the new Neck of Land collections/Intermodal Transportation Terminal/Visitor Center and the upper level of the Island Observation Building are above the 500-year floodplain, the lower level of the Observation Building would be within the 100-year floodplain. Even if artifacts are only exhibited in the structure's upper levels, water at lower levels could adversely affect the atmosphere within the building, as well as any mechanical systems providing temperature and humidity control located on the lower level. Structural protection provisions against flooding and special provisions for HVAC,

humidity, and security controls would be required. Development of an operational response plan for evacuation and protection of the display artifacts and people during emergencies would be required.

Visitors would benefit in this proposal with exhibits at the Visitor Center/Intermodal Transportation Terminal facility and the Observation Building. New interpretive techniques and the larger quantity of objects on display would enrich the visitor experience.

Exhibits in the Observation Building would remain surrounded by the 500-year floodplain. An elevated level for artifacts would be the only improvements. Prolonged power outages would be possible, accompanied by mold growth and possible water damage from a leaky roof. The Neck of Land facility offers a good location for collection storage, being outside the floodplain, although its proximity to the James River could increase its exposure to high winds. With proper planning, the risk potential should be reduced to negligible or minor for the Neck of Land facility, but the hazard remains major for the Observation Building.

Effects of Alternative D

Alternative D would remodel and expand vertically the existing Island Visitor Center to move the NPS portion of the Jamestown collection out of the basement level. Vertical expansion would use the existing building footprint to avoid construction impacts on subsurface artifacts. This alternative does not meet the joint APVA/NPS objective of keeping the two portions of the Jamestown collection in the same facility. The specific impacts of Alternative D are listed below for each of the collections.

Separation of the APVA and NPS collections would continue the current situation described under Alternative A (No Action), continuing to create confusion for researchers who would need to be educated how best to use the resources of each entity effectively. The use of the APVA and NPS collections for special artifact studies and/or

exhibits by the organizations' specialists would remain cumbersome. The overall value of the Jamestown collection as a research and educational tool would continue to be diminished. Alternative D would not strengthen the APVA/NPS partnership by allowing curators from both organizations to work side by side.

APVA Collection

There would be no immediate impacts on the APVA collections and archives if changes were not made to the present APVA facilities. While not ideal, having separate buildings for artifact processing (Dale House) and storage (Jamestown Rediscovery™ Center) could continue to work as long as both are located close to the archaeological excavations. Continuing excavations on the property would eventually necessitate expanded storage space.

Under Alternative D, the APVA would benefit by having additional space to display and interpret objects in the Ludwell exhibit facility as well as in the expanded Visitor Center. Movement of objects to new display venues, especially iron artifacts, out of the Jamestown Rediscovery™ Center's climatically controlled environment could be detrimental to their preservation and should be carefully considered. Appropriate environmental controls and security would be required in the new display areas.

NPS Collection

Alternative D would require the removal and storage of the NPS portion of the Jamestown collections and archives during construction, with potential for loss or damage, as well as the need to find a suitable interim storage facility. Although storage would be a short-term impact, any damage or loss could have permanent long-term effects. Mitigative measures would need to include appropriate environmentally controlled storage space, special inventory control and procedures, and moving by special museum collections specialists rather than by residential or commercial furniture movers.

The expanded facility would need to meet or exceed the environmental, security, and safety requirements of both the APVA and NPS. The expanded Visitor Center location is within the 100-year floodplain; although storage for the collection would be at a built level above the 500-year floodplain, this is not in compliance with the *NPS Floodplain Management Guideline, 93-4*. As a result, mitigation measures are required to protect the collections. This alternative would employ the following complementary mitigation strategies:

- 1) Provision of structural flood-proofing of the expanded Visitor Center to ensure that no flooding of the exhibit and collection storage areas or of the area beneath the exhibits and collection areas could occur.
- 2) Provision of HVAC and humidity and security equipment and controls capable of maintaining a proper environment for the collections during worst-case flood conditions (i.e., being self-contained with generators, emergency supplies, etc.).
- 3) Development of an operational response plan for protecting the collections, facility, and staff during flood conditions.

The collection also would face such natural threats as nor'easters and hurricanes; all new construction would be designed to resist these conditions, as required by codes and as necessary to protect collections.

By combining the Visitor Center, Observation Building, and NPS collection storage in a single, enlarged facility on the existing Visitor Center site, the NPS portion of the Jamestown collection would be very convenient to NPS curatorial staff and general staff who use the archives and museum collection extensively. Having the collections facility, Visitor Center, and Observation Building in the same structure would also facilitate monitoring objects that are being displayed.

Visitors would also benefit in this alternative. New interpretive techniques and the larger quantity of objects on display would enrich the visitor experience.

Exhibits and storage in the existing expanded Visitor Center would remain surrounded by the 500-year floodplain. An elevated level for artifacts would be the only improvement. Prolonged power outages would be possible, accompanied by mold growth and possible water damage from a leaky roof. Furthermore, there would be a dangerous period during renovation: if the artifacts were removed during this period, there would be the possibility of loss or damage; if the artifacts remained in place while the building was upgraded, there would be risk of fire, which is documented by a long history of museum renovation fires. Although temporary, there would be major potential for collection loss or damage.

Effects of Alternative E

Alternative E would remove the NPS portion of the Jamestown collection off Jamestown Island to another more secure location completely outside the floodplain and sheltered from windstorms. Such a location would provide greater protection for the collection, for its security and climate control. Quality warehouse space with climate and security controls would be sought at reasonable prices for long-term storage of the NPS collection. To provide maximum protection for the collection, the facility chosen under Alternative E would be located in the Williamsburg/James City County area in a place as hurricane-proof as possible, and not just simply out of the floodplain. However, this alternative does not meet the joint APVA/NPS objective of keeping the Jamestown collection in the same facility. The specific impacts of Alternative E are listed below for each of the collections.

Separation of the APVA and NPS portions of the Jamestown collection would continue the current situation described under Alternative A (No Action), continuing to create confusion for researchers who

would need to be educated how best to use the resources of each entity effectively. The use of the APVA and NPS collections for special artifact studies and/or exhibits by the organizations' specialists would remain cumbersome. The overall value of the Jamestown collections as a research and educational tool would continue to be diminished and possibly more so. Alternative E would not strengthen the APVA/NPS partnership by allowing curators from both organizations to work side by side. However, Alternative E would ensure complete separation of both collections, preventing accidental mingling between the APVA and NPS portions of the Jamestown collection.

As in all alternatives, archaeological materials recovered from excavations for new construction would have the short-term impact of immediately increasing the collection's size; expanded storage space should accommodate these additional materials.

APVA Collection

The APVA would benefit by having additional exhibit space in the Ludwell exhibit facility, the Observation Building, and the replacement Visitor Center in the existing Island parking lot. This would also improve the visitor experience. Because the facilities would be within the 500-year floodplain, structural protection provisions to prevent flooding of the exhibit area and HVAC humidity and security equipment and controls capable of maintaining a proper environment for collection objects would need to be provided as mitigative measures. An operational plan for evacuation of objects during environmental catastrophes would also be required as mitigation.

Because APVA objects would be exhibited in various facilities, movement of the objects, especially the iron artifacts, out of the climatically controlled environment of the Jamestown Rediscovery™ Center could be detrimental and should be carefully considered. Appropriate environmental controls and security would be required in the new display areas.

Processing and conservation of artifacts would be moved to the Jamestown Rediscovery™ Center collection storage area with the renovation of the Dale House as a donor/volunteer lounge. This would negatively impact the security of the APVA collection by adding multiple activities within the secure collection storage area and could introduce dirt and contaminants in the storage area. The best museum practice separates collection storage from all other activities so that collection access can be closely monitored. Special construction to provide separation of areas would be required to mitigate these impacts. Placing the processing function in the Jamestown Rediscovery™ Center would eliminate one potential hazard by taking objects directly from the excavation site to the collections building, which would be a beneficial, but minor impact.

NPS Collection

Alternative E would provide greater protection for the NPS portion of the Jamestown collection by locating it outside the 500-year floodplain in an environmentally controlled building, eliminating current threats from mold and mildew. It would, however, require packing and moving the collection and archives a moderate distance, with potential damage to, or loss of, collection items. Mitigative measures would need to include special inventory control and procedures and moving by museum collections specialists rather than by residential or commercial furniture movers.

Alternative E would more completely split the Jamestown collection into two separate entities. Separating the collection from the project area would make access for researchers using both collections and correlating the collections to the site more time consuming and expensive because they would have to travel to another location. Access for NPS staff would also be less convenient. Support of the APVA/NPS partnership would be decreased, as the curators from the two organizations would not work together.

If the new facility were leased, rental costs would initially be less than costs of construction or purchase, but would be subject to long-term rental rate increases. If the new facility were owned, costs would also include land acquisition. Legislation would be needed to acquire additional parkland or to affect a major exchange.

As noted under the “APVA Collection,” Alternative E provides additional exhibit space in the new Observation Building and replacement Visitor Center. Both facilities would remain surrounded by the 500-year floodplain. An elevated level for artifacts would be an improvement, but prolonged power outages would be possible, accompanied by mold growth and possible water damage from a leaky roof. Therefore, exhibits would remain at risk.

Viewed in its entirety, the risk encountered in Alternative E of moving the collection (which is an option in three other alternatives) combined with exhibits at Jamestown (which is stipulated in all alternatives) would be comparatively minor.

Cumulative Impacts

In all action alternatives (Alternatives B, C, D, and E), there would be no cumulative effect on the archives and collections. Provision of new appropriate archives and collection facilities, as well as avoidance or mitigation of floodplain effects would result in no irreversible or irretrievable impacts to archives and collections. Of the action alternatives, only Alternative B would beneficially impact research, education, and interpretive access to both collections.

Conclusion

For both the APVA and the NPS, the purpose and main significance of Jamestown is to preserve, interpret, and research the history of the first permanent English colony in North America. Stewardship of the Jamestown archaeological collection and associated archival documentation held by each organization is essential to their missions. Based on this, the five alternatives are summarily assessed below. Also, Table 4-6 presents a summary of impacts related to each of the storage, processing, and exhibit facilities proposed under each alternative on the Jamestown archives and collections.

Table 4-6: Summary of Impacts to Archives and Collections

Facility	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Existing Visitor Center	Major	—	—	—	—
Dale House	Negligible	Minor	Minor	Negligible	Minor
Observation Building	—	Major	Major	—	—
Expanded Existing Visitor Center	—	--	—	Major	—
Jamestown Rediscovery™ Center	Negligible	Major	Negligible	Negligible	Negligible
Replacement Visitor Center	—	Major	—	—	Major
Facilities at Neck of Land (including Intermodal Transportation Terminal, Visitor Center, and collections storage)	—	Minor	Moderate	—	Minor
Storage Facility Outside Jamestown	—	—	—	—	Negligible
Overall Impact	Major, long-term, adverse	Major, long-term, beneficial	Minor, long-term, beneficial	Moderate, long-term, beneficial	Major, long-term, adverse and beneficial

Alternative A (No Action) is the single alternative that would potentially impair the collections and archives. Alternative A represents current conditions modified only by normal changes in operating strategies and minor repairs and upgrades to facilities in future years. Under Alternative A, both collections would be at risk from flooding of access roads and consequent lack of vehicular access to collections. The NPS collection would be at risk from flooding of the collection storage area and from heating, ventilating, and air conditioning system deficiencies and power outages fostering mold and mildew conditions. Storage space for both collections would be limited when correlated to projected acquisitions of material. All of the action alternatives would mitigate this potential impairment by providing access above the 500-year floodplain and by providing improved storage and interpretive display facilities for collections. There are major differences between the action alternatives, however, which are listed below.

Alternative B has a potential beneficial impact on the collections by providing adequate processing, research, and storage space for both collections and by facilitating research and staff collaboration. The collections facility would remain in the 500-year floodplain under Alternative B but the finished floor elevation would be raised above the 500-year floodplain; special construction techniques and institution of a safety management program would mitigate potential negative impacts.

Alternatives C and E would move the NPS collection off the Island, above the 500-year floodplain, a beneficial impact to the NPS collection. Alternatives C and E could have a potential adverse impact on the APVA collection by reducing available storage area; mitigative measures would provide separation of the collection from processing contamination and ensure collection security. In addition, joint research use of collections would be adversely impacted under both Alternatives C and E. Under Alternative E, access by NPS staff would also be negatively impacted due to distance from all NPS facilities.

Alternative D would consolidate the NPS collection in the closest proximity to the APVA collection amongst Alternatives C, D, and E and would have a beneficial impact on NPS operations by minimizing distance between NPS facilities on the Island. Joint APVA/NPS research use of collections would be adversely impacted but to a lesser degree than under Alternatives C and E.

4.3.2 Impacts to Physical and Natural Resources

In order to quantify impacts to hydric and prime farmland soils, Chesapeake Bay resources, floodplains and flood zones, wetlands, and vegetation, the action alternatives were converted into GIS (Geographic Information System) layers and overlaid onto each of the data layers. For consistency, impact areas within each alternative were classified as one of the following: new bridge, new boardwalk, new dock and decking, new trail, new building/parking, temporary construction impacts, permanent disturbance area, new unpaved surface, previously disturbed-no new impact, and non-vegetated to vegetated.

Figures 4-1 through 4-11 depict these breakdowns for each alternative and apply them to the delineated jurisdictional wetland layer as an example of how the quantifications were generated.

4.3.2.1 Topography and Soils

Hydric soils cover approximately 926 acres of the Jamestown Project site while prime farmland soils cover approximately 708 acres. Because hydric soils are typically associated with wetland communities, impacts to these soils may result in a loss of potential wetland area.

Impacts to both hydric and prime farmland soils have been quantified based on the proposed limits of construction within the Jamestown Project site. When determining the intensity of impacts, the following terminology was applied:

Negligible: The impact is at the lowest levels of detection, barely measurable with no perceptible effects.

Minor: The impact is slight but detectable, with few perceptible effects, and localized in area.

Moderate: The impact is readily apparent and measurable. The resource might deviate from normal levels, but would remain viable.

Major: The impact is severely adverse. The change is readily apparent, and the resource would be permanently altered from existing conditions.

Effects of Alternative A (No Action)

This alternative does not involve any new construction of or improvements to facilities or trails. Topography would not be altered under this alternative, and there would be no new impacts to hydric or prime farmland soils. Impacts would be negligible.

Impacts Common to the Action Alternatives

There is potential for soil loss from erosion during construction activities related to the new facilities and trails; however, the implementation of an erosion and sediment control plan appropriate for the site would minimize soil loss.

The use, maintenance, and management of new facilities and trails would result in ongoing and localized minor soil disturbances, such as erosion and soil compaction. Foot traffic would also cause some compaction of soil and ground cover loss.

In order to minimize and mitigate for impacts to soils in general for all action alternatives, best management practices would be used. These may include placing construction staging areas on impervious surfaces, use of platforms for heavy equipment, and matching operating techniques to soil types and moisture levels.

Prior to any construction or facilities development, field and lab evaluations of soil samples would be conducted to determine if conditions are appropriate on the site.

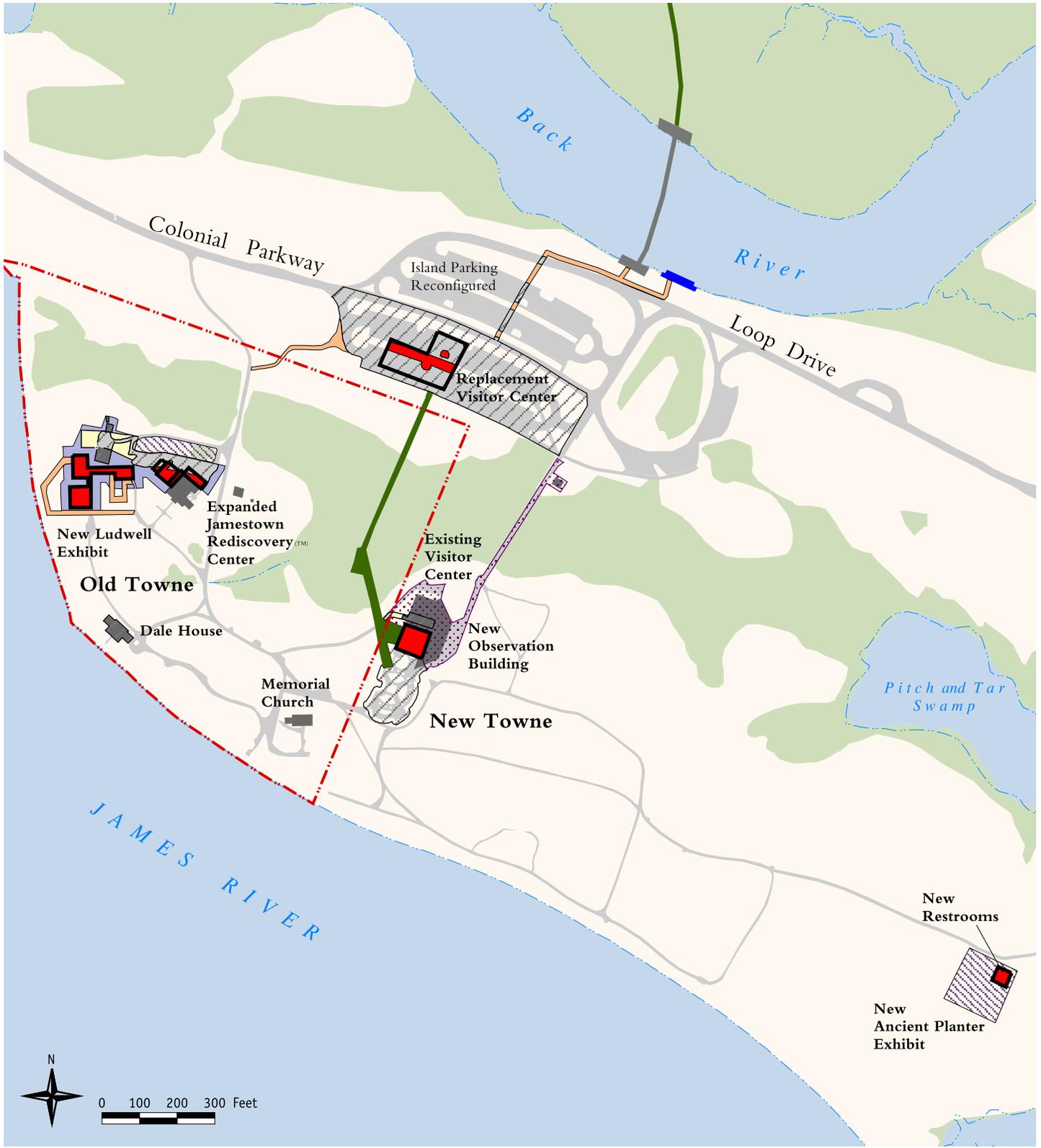
In each of the action alternatives, 0.47 acres of forest or scrub shrub would be converted to grassland. While this action would take place within prime farmland soils, there would not be an impact to the soils. Therefore, this acreage has not been included in the totals by alternative.

Effects of Alternative B

Based on the proposed actions at Neck of Land, Glasshouse Point, and Jamestown Island, impacts to hydric and prime farmland soils would occur. Alternative B would impact 1.58 acres of hydric soils and 6.80 acres of prime farmland soils. Of these, 0.69 acres of hydric soils and 5.12 acres of prime farmland soils would be covered by new buildings, roadways, or parking lots, while 1.62 acres of prime farmland soils and 0.17 acres of hydric soils would be covered by trails. In addition, 0.71 acres of hydric soils and 0.06 acres of prime farmland would be beneath raised boardwalks, docks, or bridges. Overall adverse impacts would be minor, and impacts to topography would be negligible.

Effects of Alternative C

The proposed actions on Neck of Land, Glasshouse Point, and Jamestown Island would impact hydric and prime farmland soils. Alternative C would impact 0.99 acres of hydric soils and 6.97 acres of prime farmland soils. Of these, 0.74 acres of hydric soils and 6.08 acres of prime farmland soils would be covered by new buildings, roadways, or parking lots, while 0.13 acres of hydric soils and 0.87 acres of prime farmland soils would be covered by trails. An additional 0.12 acres of hydric soils and 0.02 acres of prime farmland soils would be covered by raised boardwalks or docks. Overall, adverse impacts would be minor, and impacts to topography would be negligible.



Legend

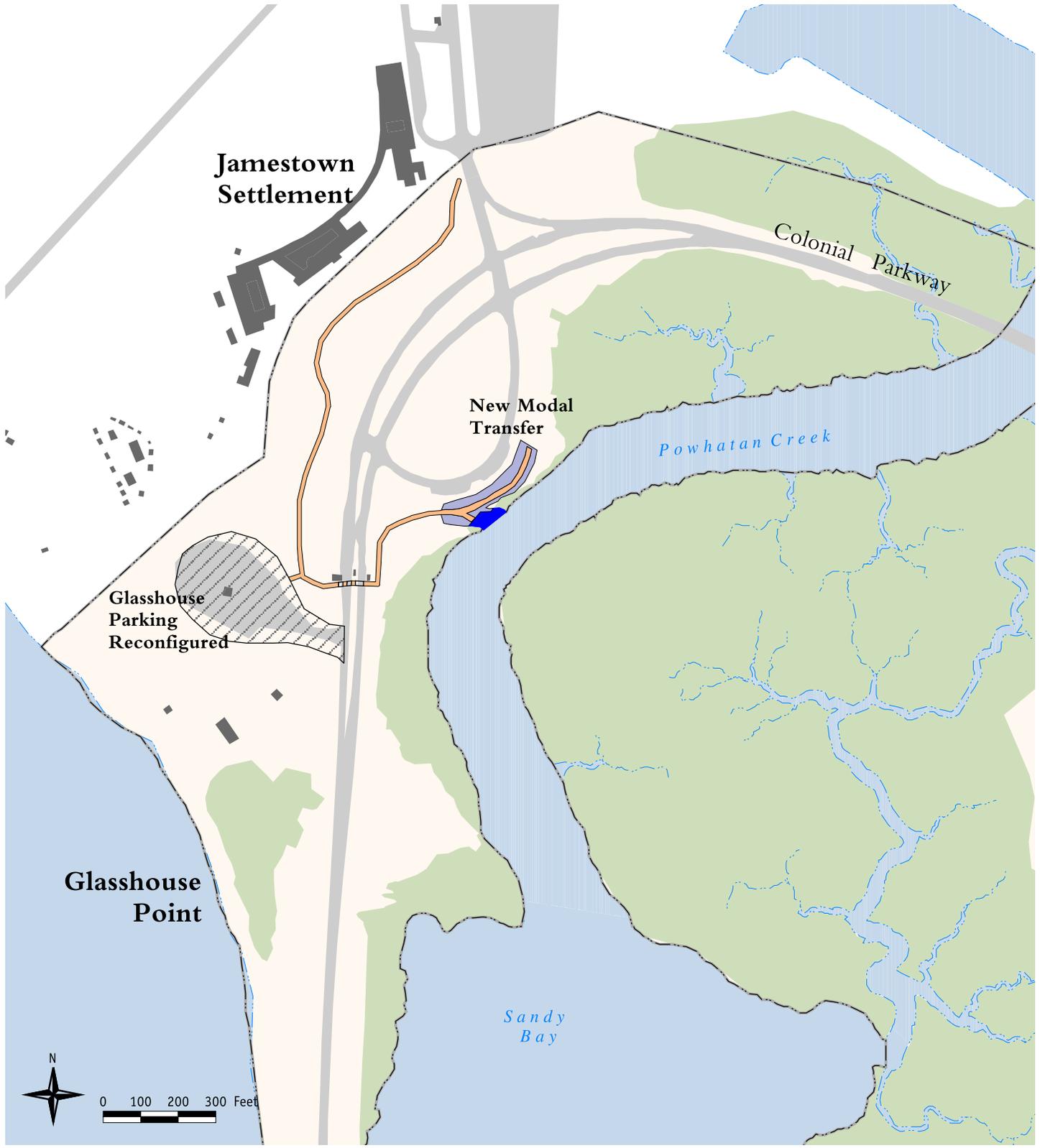
- | | | |
|-----------------------------|--------------------------------------|------------------------------|
| ■ New Bridge (0.07) | □ New Building Footprint | ■ New Unpaved Surface |
| ■ New Boardwalk (0.72) | ■ Temporary Construction Impact | — Existing Roadways & Access |
| ■ New Dock & Decking (0.08) | ▨ Disturbance Area - Permanent | --- APVA Boundary |
| ■ New Trail | ▨ Previously Disturbed No New Impact | ■ Existing Buildings |
| ■ New Building / Parking | ▨ Non-vegetated to Vegetated | ■ Delineated Wetland |

Figure 4-1: Alternative B Impact Analysis

Jamestown Island

Notes: Numbers in parentheses represent total project impacts to jurisdictional wetlands in acres.

Direct impact to non-jurisdictional wetland North of the Jamestown Rediscovery (TM) Center: 0.03 acres.



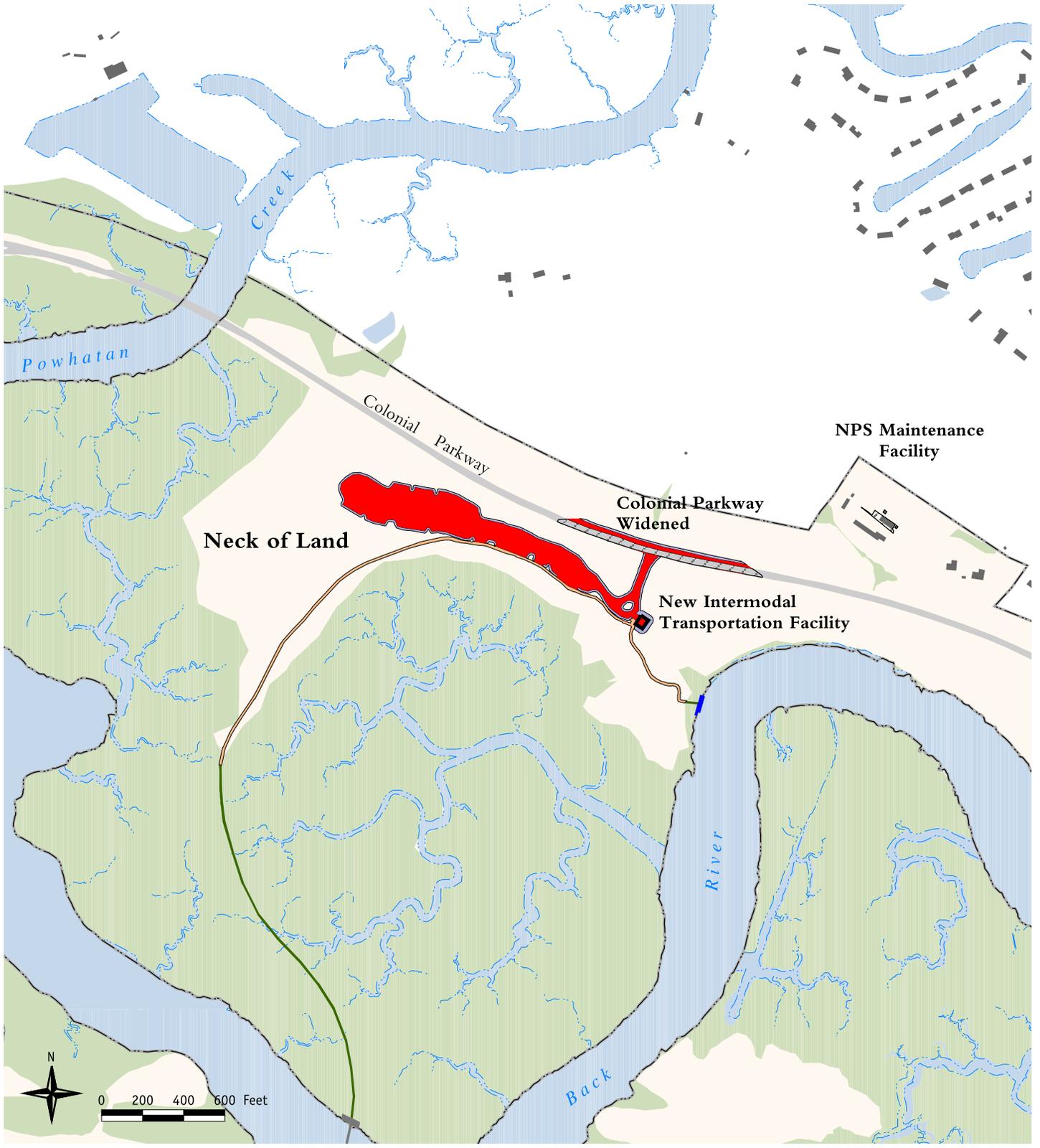
Legend

- | | | |
|---------------------------|---------------------------------------|----------------------------|
| New Bridge (0.07) | New Building Footprint | New Unpaved Surface |
| New Boardwalk (0.72) | Temporary Construction Impact | Existing Roadways & Access |
| New Dock & Decking (0.08) | Disturbance Area - Permanent | APVA Boundary |
| New Trail | Previously Disturbed
No New Impact | Existing Buildings |
| New Building / Parking | Non-vegetated to Vegetated | Delineated Wetland |

Figure 4-2: Alternative B Impact Analysis

Powhatan Creek Overlook

Note: Numbers in parentheses represent total project impacts to jurisdictional wetlands in acres.



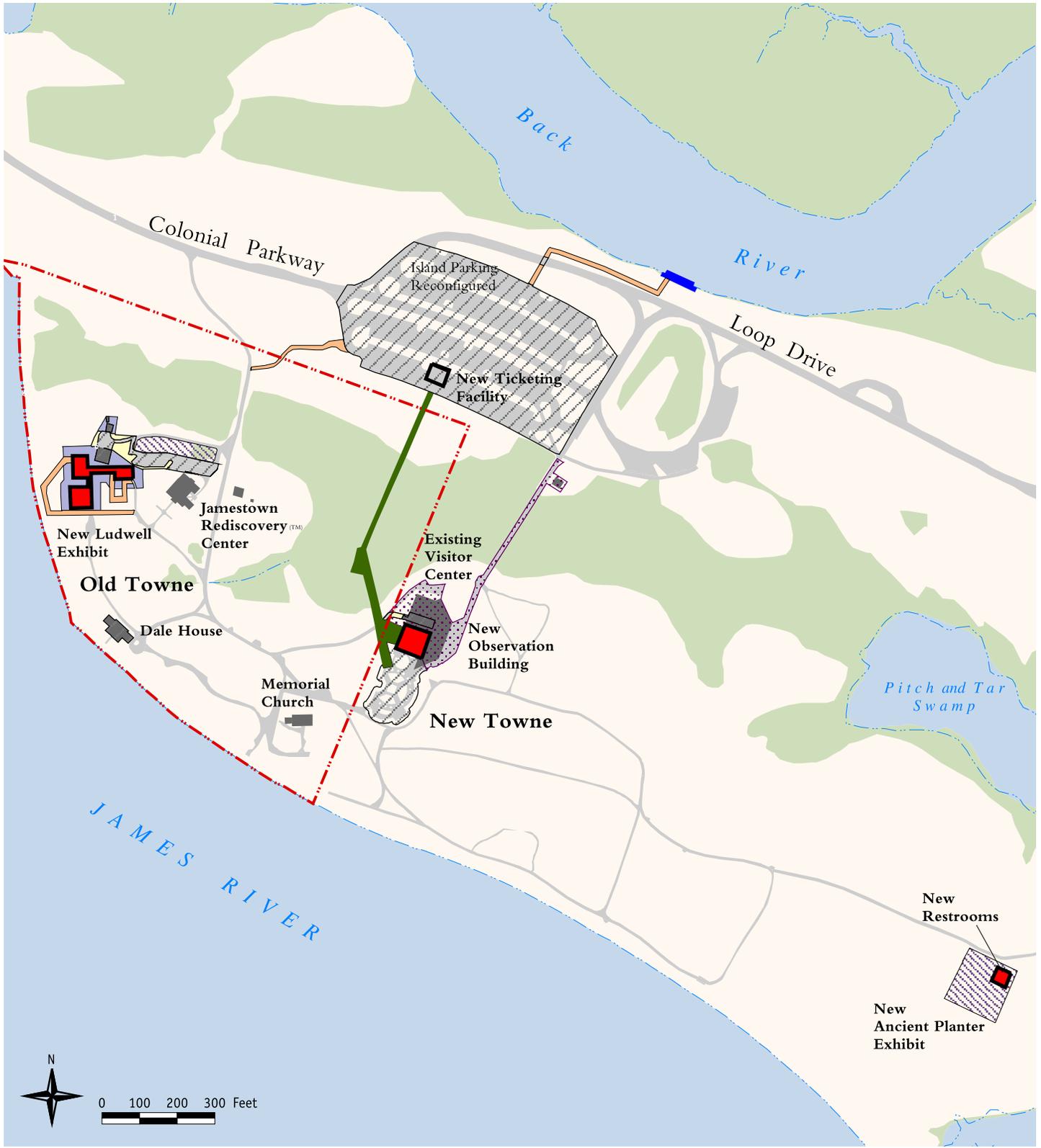
Legend

- | | | |
|---------------------------|------------------------------------|----------------------------|
| New Bridge (0.07) | New Building Footprint | New Unpaved Surface |
| New Boardwalk (0.72) | Temporary Construction Impact | Existing Roadways & Access |
| New Dock & Decking (0.08) | Disturbance Area - Permanent | APVA Boundary |
| New Trail | Previously Disturbed No New Impact | Existing Buildings |
| New Building / Parking | Non-vegetated to Vegetated | Delineated Wetland |

Figure 4-3: Alternative B Impact Analysis

Neck of Land

Note: Numbers in parentheses represent total project impacts to jurisdictional wetlands in acres.



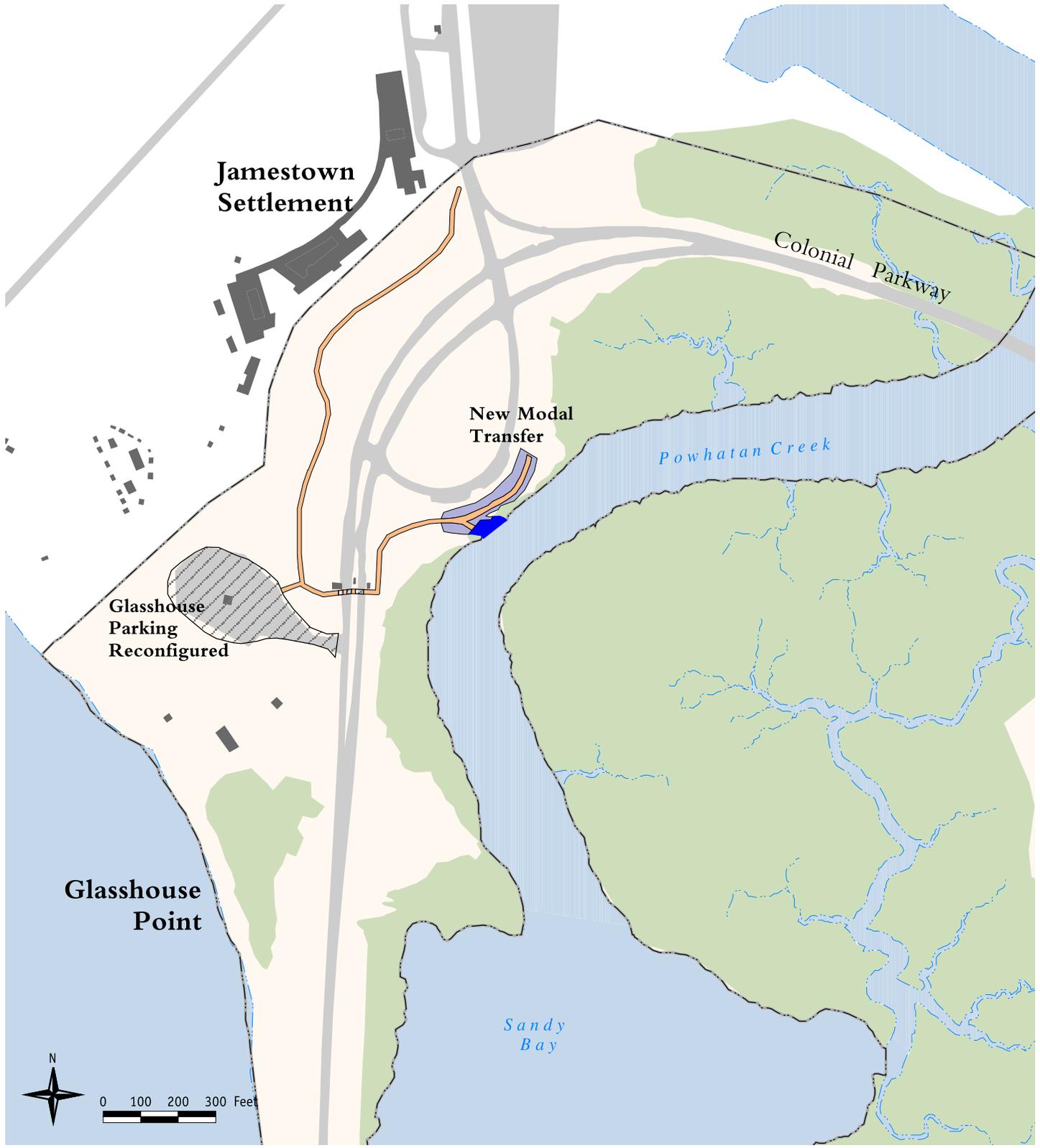
Legend

Figure 4-4: Alternative C Impact Analysis

Jamestown Island

Note: Numbers in parentheses represent total project impacts to jurisdictional wetlands in acres.

Direct impact to non-jurisdictional wetland North of the Jamestown Rediscovery (TM) Center: 0.03 acres.



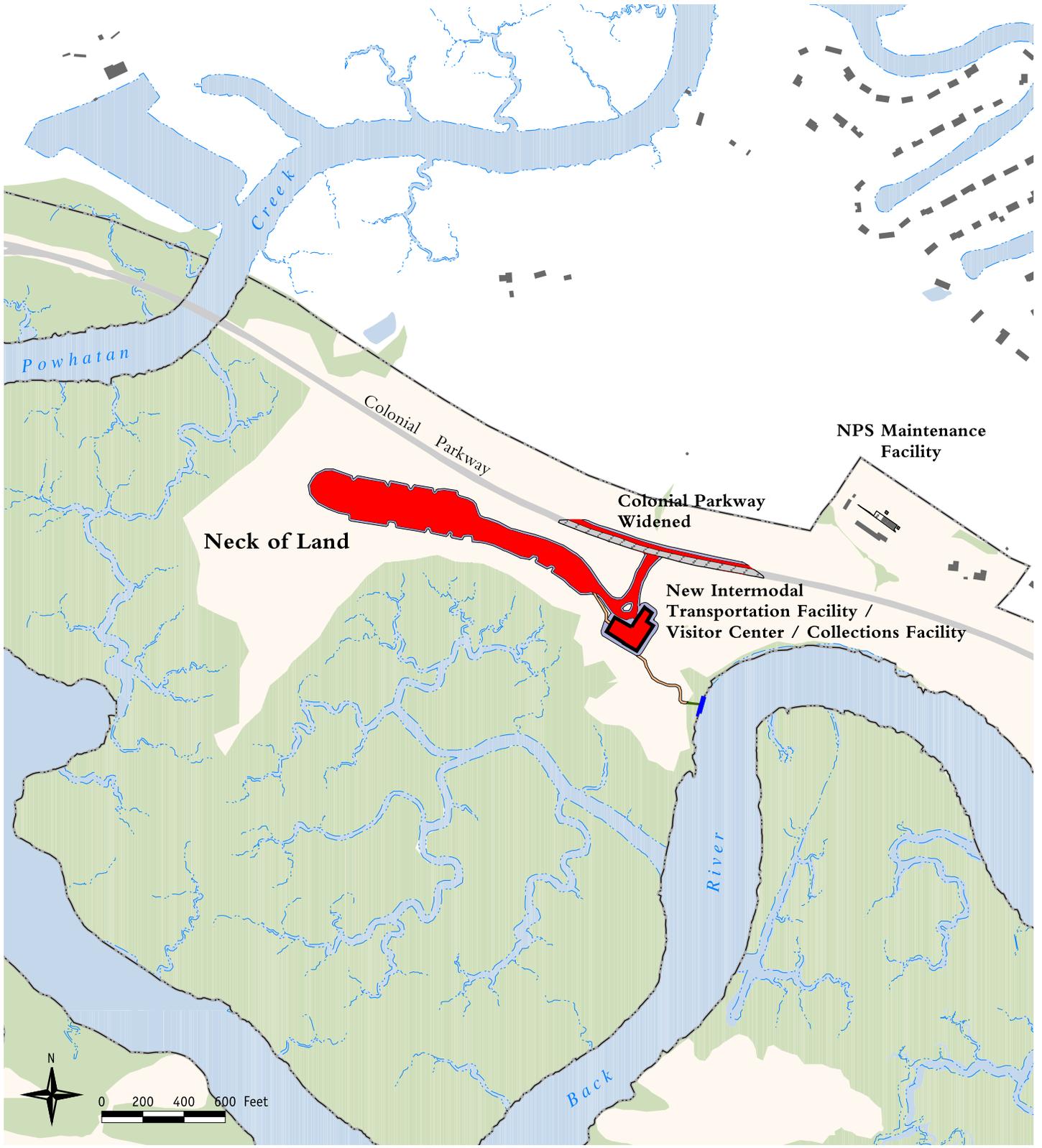
Legend

- | | | |
|---------------------------|------------------------------------|----------------------------|
| New Bridge | New Building Footprint | New Unpaved Surface |
| New Boardwalk (0.20) | Temporary Construction Impact | Existing Roadways & Access |
| New Dock & Decking (0.08) | Disturbance Area - Permanent | APVA Boundary |
| New Trail | Previously Disturbed No New Impact | Existing Buildings |
| New Building / Parking | Non-vegetated to Vegetated | Delineated Wetland |

Figure 4-5: Alternative C Impact Analysis

Powhatan Creek Overlook

Note: Numbers in parentheses represent total project impacts to jurisdictional wetlands in acres.



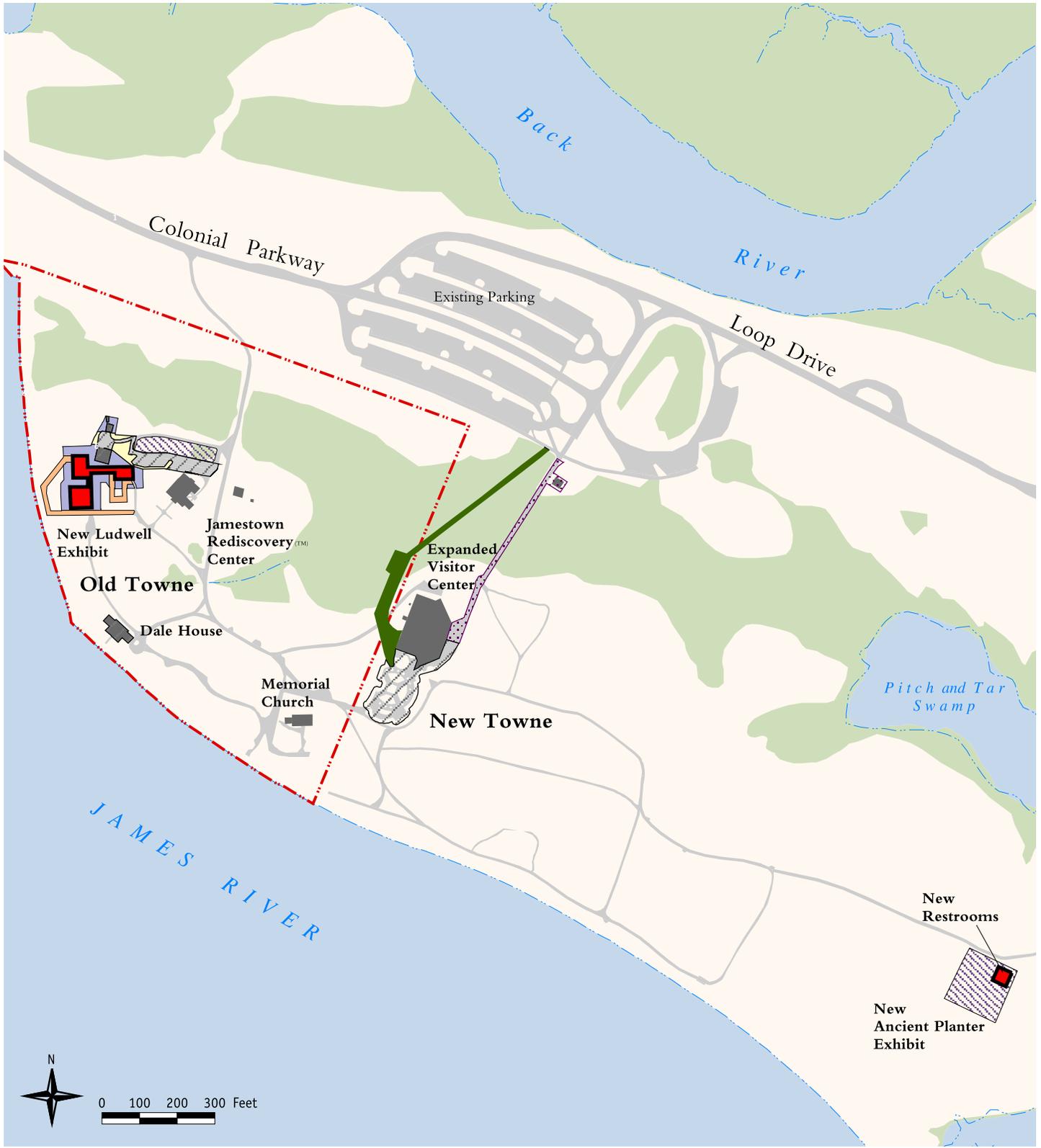
Legend

- | | | |
|---------------------------|---------------------------------------|----------------------------|
| New Bridge | New Building Footprint | New Unpaved Surface |
| New Boardwalk (0.20) | Temporary Construction Impact | Existing Roadways & Access |
| New Dock & Decking (0.08) | Disturbance Area - Permanent | APVA Boundary |
| New Trail | Previously Disturbed
No New Impact | Existing Buildings |
| New Building / Parking | Non-vegetated to Vegetated | Delineated Wetland |

Figure 4-6: Alternative C Impact Analysis

Neck of Land

Note: Numbers in parentheses represent total project impacts to jurisdictional wetlands in acres.



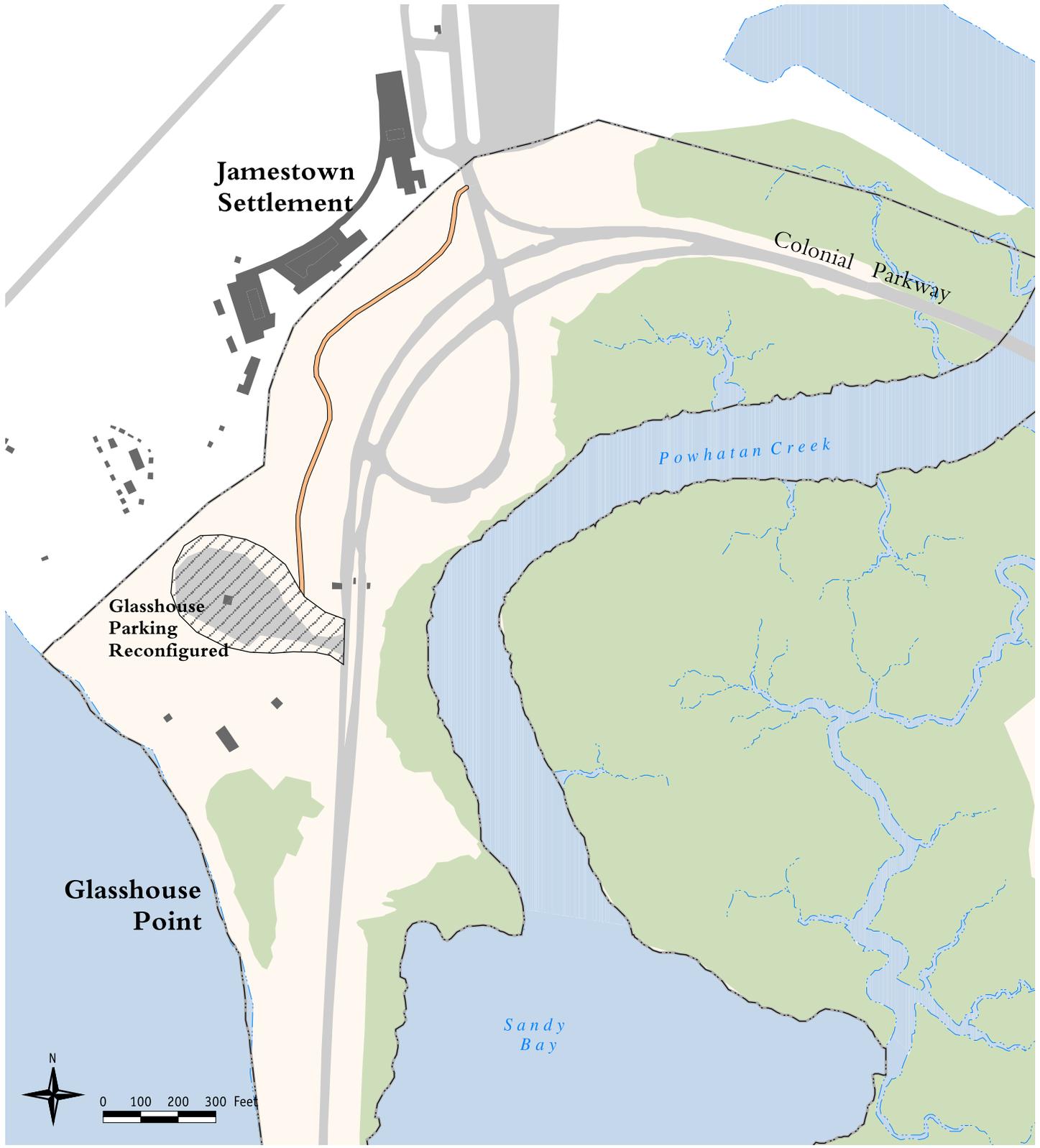
Legend

- | | | |
|------------------------|------------------------------------|----------------------------|
| New Bridge | New Building Footprint | New Unpaved Surface |
| New Boardwalk (0.27) | Temporary Construction Impact | Existing Roadways & Access |
| New Dock & Decking | Disturbance Area - Permanent | APVA Boundary |
| New Trail | Previously Disturbed No New Impact | Existing Buildings |
| New Building / Parking | Non-vegetated to Vegetated | Delineated Wetland |

Figure 4-7: Alternative D Impact Analysis

Jamestown Island

Note: Numbers in parentheses represent total project impacts to jurisdictional wetlands in acres.
 Direct impact to non-jurisdictional wetland North of the Jamestown Rediscovery (TM) Center: 0.03 acres.



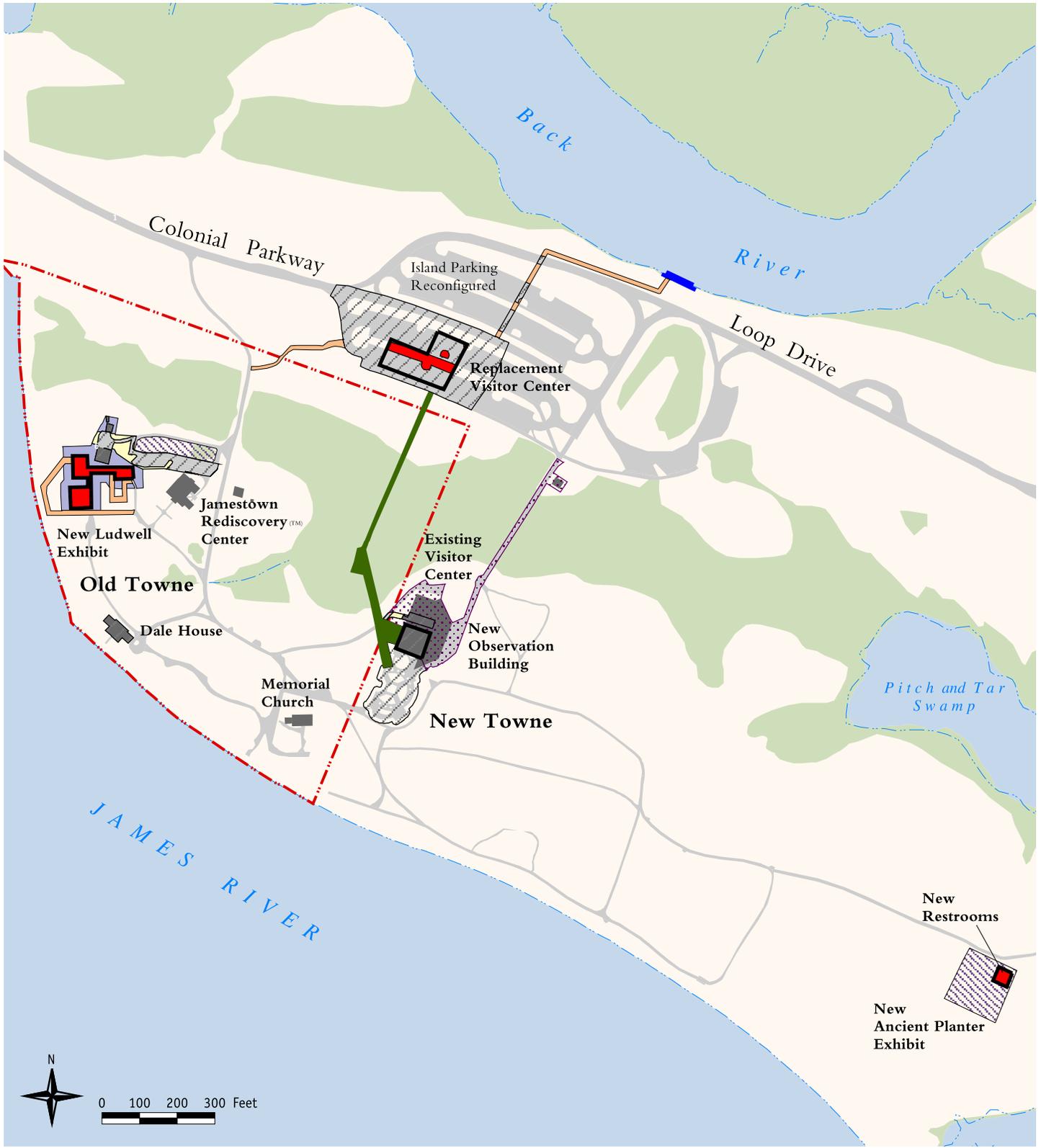
Legend

- | | | |
|------------------------|---------------------------------------|----------------------------|
| New Bridge | New Building Footprint | New Unpaved Surface |
| New Boardwalk (0.27) | Temporary Construction Impact | Existing Roadways & Access |
| New Dock & Decking | Disturbance Area - Permanent | APVA Boundary |
| New Trail | Previously Disturbed
No New Impact | Existing Buildings |
| New Building / Parking | Non-vegetated to Vegetated | Delineated Wetland |

Figure 4-8: Alternative D Impact Analysis

Powhatan Creek Overlook

Note: Numbers in parentheses represent total project impacts to jurisdictional wetlands in acres.



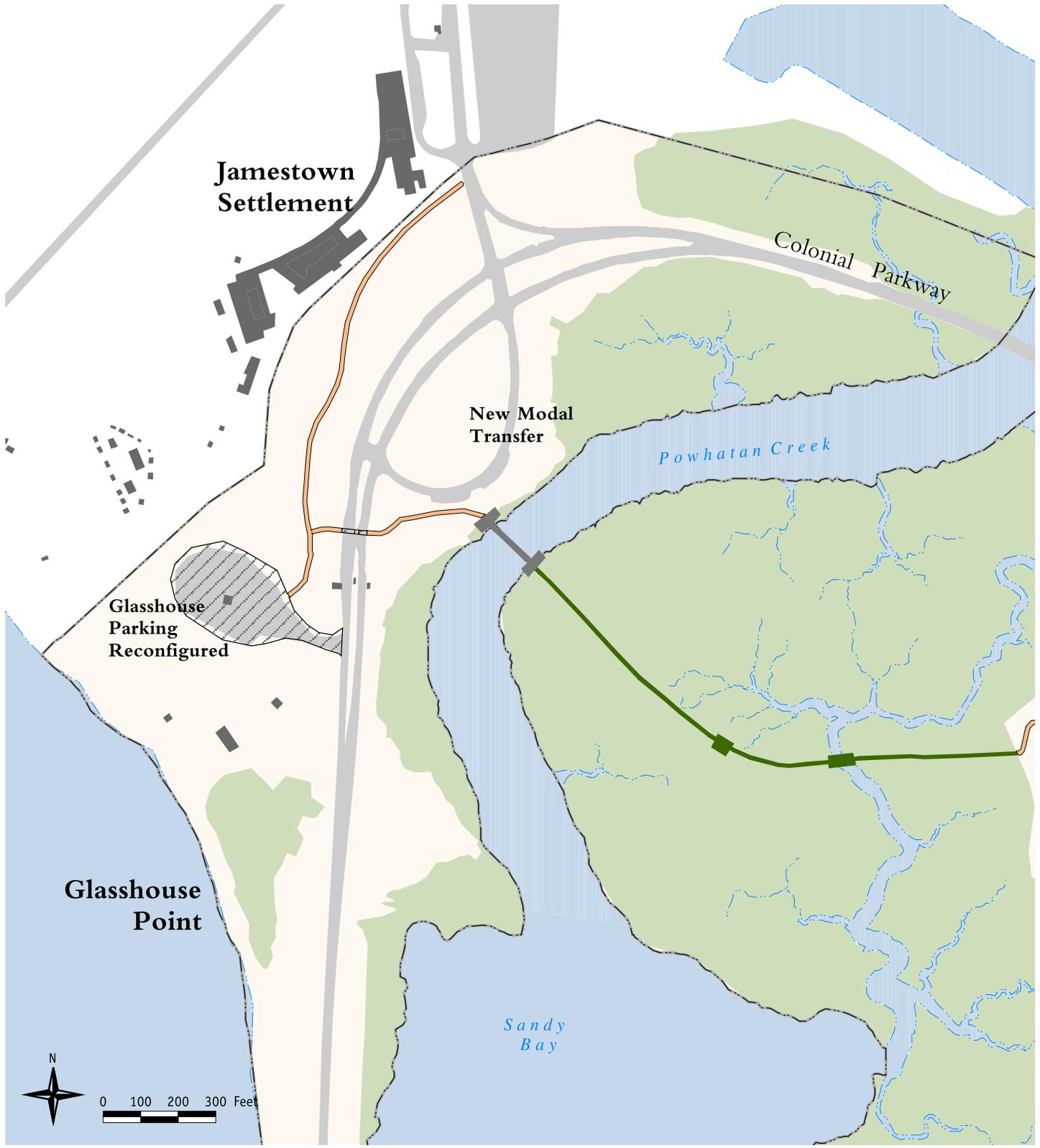
Legend

- | | | |
|---------------------------|------------------------------------|----------------------------|
| New Bridge (0.06) | New Building Footprint | New Unpaved Surface |
| New Boardwalk (0.71) | Temporary Construction Impact | Existing Roadways & Access |
| New Dock & Decking (0.03) | Disturbance Area - Permanent | APVA Boundary |
| New Trail | Previously Disturbed No New Impact | Existing Buildings |
| New Building / Parking | Non-vegetated to Vegetated | Delineated Wetland |

Figure 4-9: Alternative E Impact Analysis

Jamestown Island

Note: Numbers in parentheses represent total project impacts to jurisdictional wetlands in acres. Direct impact to non-jurisdictional wetland North of the Jamestown Rediscovery (TM) Center: 0.03 acres.



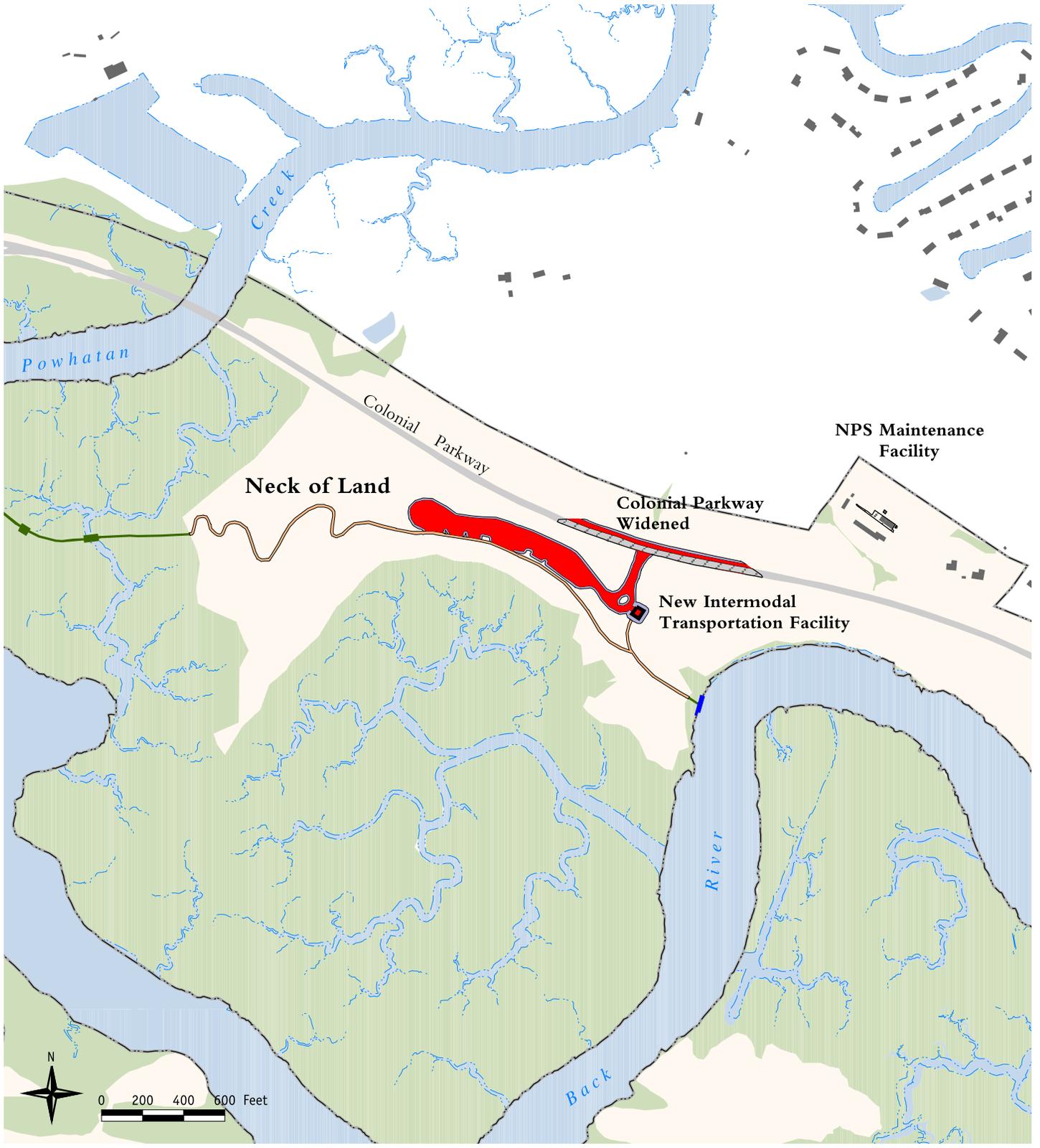
Legend

- | | | |
|---------------------------|---------------------------------------|----------------------------|
| New Bridge (0.06) | New Building Footprint | New Unpaved Surface |
| New Boardwalk (0.71) | Temporary Construction Impact | Existing Roadways & Access |
| New Dock & Decking (0.03) | Disturbance Area - Permanent | APVA Boundary |
| New Trail | Previously Disturbed
No New Impact | Existing Buildings |
| New Building / Parking | Non-vegetated to Vegetated | Delineated Wetland |

Figure 4-10: Alternative E Impact Analysis

Powhatan Creek Overlook

Note: Numbers in parentheses represent total project impacts to jurisdictional wetlands in acres.



Legend

- | | | |
|---------------------------|---------------------------------------|----------------------------|
| New Bridge (0.06) | New Building Footprint | New Unpaved Surface |
| New Boardwalk (0.71) | Temporary Construction Impact | Existing Roadways & Access |
| New Dock & Decking (0.03) | Disturbance Area - Permanent | APVA Boundary |
| New Trail | Previously Disturbed
No New Impact | Existing Buildings |
| New Building / Parking | Non-vegetated to Vegetated | Delineated Wetland |

Figure 4-11: Alternative E Impact Analysis

Neck of Land

Note: Numbers in parentheses represent total project impacts to jurisdictional wetlands in acres.

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Effects of Alternative D

Based on the proposed renovations to the Island and at Glasshouse Point, Alternative D would impact 0.23 acres of hydric soils and 0.68 acres of prime farmland soils. Of these, 0.19 acres of hydric soils and 0.26 acres of prime farmland soils would be covered by new buildings, roadways, or parking lots, while 0.03 acres of hydric soils would be covered by raised boardwalks. In addition, 0.42 acres of prime farmland soils would be covered by trails. Overall adverse impacts would be negligible to both soils and topography.

Effects of Alternative E

As with the other alternatives, proposed actions on Neck of Land, Glasshouse Point, and Jamestown Island would impact hydric and prime farmland soils. Alternative E would impact 0.95 acres of hydric soils and 4.96 acres of prime farmland soils. Of these, 0.63 acres of hydric soils and 3.41 acres of prime farmland soils would be covered by new buildings, roadways, or parking lots, while 0.12 acres of hydric soils and 1.53 acres of prime farmland soils would be covered by trails. An additional 0.63 acres of hydric soils and 0.02 acres of prime farmland would be covered by raised boardwalks, docks, or bridges. Overall adverse impacts would be minor, and impacts to topography would be negligible.

Cumulative Impacts

Actions outside the Jamestown Project area in combination with future park actions have resulted in and would continue to result in conversion and loss of hydric and prime farmland soils in James City County and Williamsburg. The cumulative effects of these actions over time would reduce the viability and sustainability of farming in the area, though little land has been converted to farming recently. However, the adverse effects of actions outside the project area are more substantial than those resulting from the project or other park actions.

Conclusion

All of the action alternatives would result in negligible or minor losses of both hydric and prime farmland soils. Impacts to topography would be negligible. Alternative B would have the greatest impact on hydric soils while Alternative C would have the greatest impact on prime farmland soils. Loss would be minimized through the use of best management practices, as well as implementation of an erosion and sediment control plan. For all alternatives, because overall impact would be negligible or minor, none of the alternatives would result in impairment of hydric or prime farmland soils within the Jamestown Project study area.

4.3.2.2 Chesapeake Bay Resources

The Chesapeake Bay Preservation Act (CBPA) was enacted by the Virginia Commonwealth in 1988 to regulate land use for the protection and improvement of water quality within the Chesapeake Bay. The Commonwealth has delegated the responsibility of implementing the CBPA to the counties and localities through their zoning ordinances and comprehensive land plans.

Areas affected by the CBPA include those lands most influential to the water quality of the Chesapeake Bay: Resource Protection Areas (RPA) and Resource Management Areas (RMA).

RPAs afford the highest protection due to their proximity to the Chesapeake Bay tidal estuaries and the water quality functions these areas provide. Work within RPAs is limited to certain land uses, and approval must be provided by the Zoning Board of the municipality/county. RPAs include:

- Tidal wetlands
- Tidal shores
- Non-tidal wetlands connected by surface flow (perennial stream) and adjacent to tidal wetlands or tributary streams
- A 100-foot buffer landward of the above features.

RMA's are additional sensitive lands beyond the RPA's that also have intrinsic water quality benefits. These lands include or contain:

- Floodplains
- Highly erodible soils
- Highly permeable soils
- Nontidal wetlands not included in the RPA
- Any other lands under the provisions of subsection A of 9VAC10-20-90 necessary to protect the quality of state waters.

All tidal wetlands and property 100 feet landward of the tidally influenced wetlands on Glasshouse Point, Neck of Land, and Jamestown Island would be considered part of the RPA. In addition, the entire James City County has been designated as part of the RMA; therefore, impacts to the RMA are unavoidable and are accepted as necessary within the county so long as performance standards are met. Impacts to the RPA are allowed for water-dependent uses or redevelopment only.

The NPS, a signatory of the Chesapeake Bay Agreement, is also committed to preserving riparian buffers. The NPS's riparian buffer plan calls for conservation of stream and shoreline buffers, and specifically restoration of 35 miles of streams and shoreline buffers in the Chesapeake Bay watershed by 2010. Riparian buffers should be at least 100 feet wide to adequately protect water quality in streams.

Methodology

The discussion below describing CBPA impacts includes those that would occur within the RPA only. Again, the RPA includes tidal wetlands and the 100-foot buffer, as it pertains to the reduction in the filtering capacity of the buffer due to the reduction in trees and increase in impervious surface. Each alternative, however, would be engineered to capture and treat the impervious surface runoff as a means of offsetting the loss of buffering function that each buffer offers. To assess impacts to the RPA, the following thresholds were used:

Negligible: An action that would result in no additional disturbance to the RPA. Actions that constitute redevelopment or are water-dependent are exempt from CBPA regulations and would also be considered to have a negligible impact.

Minor: An action that encroaches into the first 50 feet (landward) of the 100-foot RPA buffer.

Moderate: An action that encroaches into the first 50 feet (landward) of the 100-foot RPA buffer for a linear distance of 200 feet.

Major: An action that encroaches into the 50-foot RPA buffer.

Effects of Alternative A (No Action)

Alternative A calls for no additional structures or improvements, and no direct impacts to RPA features would result; therefore, impacts resulting from this alternative would be negligible. However, existing development at Jamestown was completed prior to implementation of regulations and standards regarding Chesapeake Bay buffer requirements and stormwater runoff so there are no existing mitigative measures in place. For example, existing structures, such as the Visitor Center, are partially located within the 100-foot RPA buffer along the Pitch and Tar Swamp wetlands. This limits the buffer's ability to filter pollutants and minimize stormwater runoff.

Impacts Common to the Action Alternatives

Pedestrian Footbridge

The existing footbridge crossing Pitch and Tar Swamp and neighboring restrooms, which together occupy approximately 5,000 square feet (0.11 acres) of the RPA buffer, would be removed under all action alternatives. The removal of these features would serve to enhance the RPA buffer once the former site revegetates. The impact from this activity would be moderate and beneficial. The pedestrian footbridge would be relocated further west to allow for more expansive views of the Townsite, an

improvement to the visitor experience. The new footbridge would be constructed at an appropriate height to allow for sunlight penetration to the wetland and RPA vegetation below. In addition, because of the increased height, water flow would be less restricted.

Jamestown Rediscovery™ Center Parking

Each alternative calls for expanding the parking at the Jamestown Rediscovery™ Center. The total impacts would be slightly different in each alternative; however in all alternatives the improvement would encroach into the first 50 feet of the 100-foot RPA buffer. The improvements to the parking area at the Jamestown Rediscovery™ Center would occur within existing gravel and disturbed areas, and mitigative measures taken to minimize the impacts of any increase in impervious cover would result in no long-term impacts to the RPA. Stormwater measures, which currently do not exist, would be put into place to accommodate increased runoff. These would likely consist of grass swales, small underground flexible pipes, bio-pavers, and marsh ponds for water quality control. In each alternative, expanding the parking area would have minor adverse effects on the RPA.

Dale House

The Dale House is located completely within the RPA buffer. The 3,000 square feet (0.07 acre) structure would undergo interior renovation as part of each of the alternatives. These renovations would not have an additional impact on the RPA and would be considered negligible.

Trails and Docks

Each alternative involves the construction of new trails and boardwalks throughout the Jamestown Project site; however, exceptions to the requirements of the James City County Chesapeake Bay Preservation Ordinance are generally granted for boardwalks and trails. Trails do not diminish the filtering capability of the buffer and therefore do not require mitigation. They are considered to be a negligible adverse impact on the RPA.

Similarly, Alternatives B, C, and E include construction of boat docks within the RPA; however, development that is water dependent is allowed within the RPA under the James City County Chesapeake Bay Preservation Ordinance. Construction of docks would be considered a negligible impact on the RPA.

Utilities

Each alternative (including the No Action Alternative) would include the underground extension of a water main and sewer line to the Jamestown Rediscovery™ Center. By regulation, the water main must always remain a minimum of 10 feet from the sewer line. This would require the trenching of two separate corridors, one for each line. Trenching would be done with a small backhoe using a ±1-foot wide bucket at a depth of approximately four feet. The extensions would begin at a connecting point with the existing lines immediately adjacent to the Colonial Parkway entrance to the Jamestown Island parking lot. This work would encroach into the RPA near the beginning of the APVA service road, north of the Pitch and Tar Swamp. It is expected, however, that the lines would be installed within the existing service road right-of-way once within the RPA, such that vegetation removal would be minimized. As the service road turns southward to cross the Pitch and Tar Swamp, so would the utility lines. One line would be on the extreme western side of the road, and the other line would be located on the extreme eastern shoulder of the road in order to maintain the 10-foot wide separation.

The service road that crosses the Pitch and Tar Swamp contains several wax myrtle shrubs (*Myrica cerifera*) along its shoulders and immediately adjacent to the wetlands. The excavation activities required to install the utility lines could result in the removal of several wax myrtle shrubs, as well as temporary disturbances to water quality in the neighboring wetland due to sedimentation. Silt fences would be utilized to minimize the level of disturbance to water quality, and given the highly

dense population of wax myrtles in this area, they would quickly re-establish to further stabilize the soil after the installation work is completed. As such, this impact would be considered a short-term, negligible impact.

Mitigation

Mitigative actions would be carried out for all the action alternatives. Designing for retention of runoff, filtering surface pollutants, and minimizing impervious cover as much as possible, would minimize runoff from impervious areas. A stormwater collection and retention system for water quantity and quality would direct filtered stormwater to existing marsh areas. Best Management Practice (BMP) facilities, such as a marsh ponds, could also be constructed upstream of the existing marsh to ensure downstream water quality. The APVA and NPS would work closely with the Center for Watershed Protection (CWP) to ensure that the most recent technologies are implemented.

Effects of Alternative B

A total of 12,632 square feet of existing infrastructure would be removed from the RPA and returned to its natural vegetative state, including the existing Visitor Center, the pedestrian footbridge, the footbridge comfort station, and parking adjacent to the Visitor Center. While this removal does not directly offset impacts of the proposed project, it would serve to increase the functional capacity of the RPA buffer in these locations. For example, this removal would include the portion of the existing Visitor Center that is located within the RPA buffer (3,200 square feet). Modifications to the Visitor Center would be made in Alternative B in order to construct the Observation Building. The existing Visitor Center would be reduced in size from 29,000 to 5,000 square feet, removing it completely from the RPA buffer. This area would then be allowed to revegetate, and its buffering capacity would be restored, a minor, beneficial impact.

Direct adverse impacts to the RPA buffer would occur only on the APVA property at the expansion of the Jamestown Rediscovery™ Center and its adjacent parking. Approximately 3,223 square feet of RPA would be impacted by these actions. This impact would occur in the first landward 50 feet of the 100-foot RPA buffer and therefore would be minor in intensity. Mitigative measures would include those discussed under “Impacts Common to the Action Alternatives.”

Effects of Alternative C

As in Alternative B, areas would be allowed to revegetate following the removal of existing structures. This would total 12,632 square feet and would help to restore the filtering capacity of a portion of the RPA.

Approximately 2,918 square feet of impact would accrue to the RPA as a result of Alternative C. This impact would occur at the Jamestown Rediscovery™ Center parking area, as discussed under “Impacts Common to the Action Alternatives.” The impact would occur in the first 50 feet landward of the 100-foot buffer. The impact, therefore, would be considered minor in intensity.

Effects of Alternative D

Overall, 4,390 square feet of vegetation within the RPA would be restored as a result of removing existing infrastructure, such as the pedestrian footbridge and comfort station. In Alternative D, the Visitor Center would be renovated, but its footprint would be maintained; therefore 3,200 square feet of the building would remain in the RPA buffer. There would be no increase in impervious cover at this site so the impact would be negligible.

Direct impacts would again be limited to those at the Jamestown Rediscovery™ Center parking area. The total adverse impacts associated with Alternative D would be 2,134 square feet within the first 50 feet landward of the 100-foot RPA buffer, a minor impact.

Effects of Alternative E

As in Alternatives B and C, areas would be allowed to revegetate following the removal of existing structures. This would total 12,632 square feet and would help to restore the filtering capacity of a portion of the RPA, a minor, beneficial impact.

As in all the action alternatives, direct, adverse impacts to the RPA would also occur at the Jamestown Rediscovery™ Center parking area and would total 2,526 square feet of unpaved surface within the first 50 feet landward of the 100-foot RPA buffer. This impact would be minor.

Cumulative Impacts

Development not only within the Jamestown Project study area, but also throughout the region has the potential to impact riparian buffer function and water quality within the James River and its tributaries. In particular, localized development along the Powhatan Creek, an ecologically sensitive watershed, would increase impervious cover as well as adverse impacts to the RPA. Coordination with groups such as the CWP, which specializes in assessing impacts at the watershed level, can minimize the impacts of individual development projects, such as this one. Further, strict adherence to regulations set forth by James City County, as well as the recommendations of the *Federal Agencies' Chesapeake Ecosystem Unified Plan* (Chesapeake Bay Program 1998), ensure protection of riparian buffers.

Conclusion

Impacts to all components of the RPA (tidal wetlands, tidal shores, non-tidal wetlands connected by surface water, and the adjacent 100-foot buffer) would be no more than minor in intensity for each alternative. Table 4-7 provides a summary of impacts, both direct and indirect, to the RPA.

Primary impacts from proposed improvements would result from increases in impervious cover from the construction of an unpaved parking area at the Jamestown Rediscovery™ Center. Mitigative measures taken to minimize any potential impacts would include strong and monitored erosion and sediment control plans, innovative stormwater management, and careful design planning. In addition, the APVA and NPS would continue to work with the Center for Watershed Protection to define state-of-the-art technologies to deal with runoff pollution. Because of the strong measures that would be taken, no long-term adverse impacts to the RPA would result from any of the action alternatives.

Because adverse impacts have been identified as negligible or minor, none of the alternatives would result in a permanent impairment to Chesapeake Bay Preservation Areas.

Table 4-7: Summary of Impacts to Chesapeake Bay Resource Protection Areas (acres)

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
New Building/Parking	—	0.07	0.07	0.05	0.06
Trails	—	0.97	0.42	0.08	0.41
Docks and Associated Decking	—	0.17	0.17	—	0.09
Boardwalk	—	0.88	0.35	0.39	0.84
Bridge	—	0.21	—	—	0.15
Unpaved Surface	—	0.05	0.05	0.03	0.04
Overall Impact	Negligible	Minor	Minor	Negligible	Minor

4.3.2.3 Surface Waters

Impacts to surface waters are discussed below in the following sections: “Shoreline and Nearshore Environment,” “Hydrodynamic Setting,” and “Water Quality.”

Shoreline and Nearshore Environment

The *Shoreline Management Plan* (Hardaway et al. 1999) develops recommendations that address shoreline erosion at Jamestown Island. In all, the plan recommends six different types of structures for use in the area, including revetments, two sills with different crest elevations, low broad-crested breakwaters, and two larger breakwaters with different crest elevations. In addition, sand nourishment would be used to create a stable substrate for establishing wetland vegetation. Construction of these features would be phased, with the first series slated to begin upon approval of the environmental compliance documentation.

Actions suggested for various areas within the Jamestown Project are summarized below:

- A low revetment and sill protects the shore along the Glasshouse area; however, waves easily overtop this. Monitoring and repair of these structures are recommended.
- Eroding upland banks and marsh headlands along Powhatan Creek, Sandy Bay, and Back River constitute the focus of the plan in those areas. While stone revetments would halt the erosion of these features, offshore sills with a sand substrate would allow the establishment of a marsh fringe. This would be much preferred in terms of aesthetics and estuarine habitat.
- A sloped concrete seawall at the original Jamestown Fort area and a stone revetment just downstream are old and initial evaluations by the U.S. Army

Corps of Engineers (COE) suggest adding armor stone and raising the crest elevation of the structure.

- The remaining shoreline along the James River is unprotected and eroding. The long-term plan recommends breakwaters and spurs strategically placed along the entire shore. The breakwaters would be placed in front of ridges to allow embayments to form in the marsh areas between. The NPS should consider placing sand available from the dredging of offshore navigation channels along the shore between established headlands. Black Point, an important headland feature, would be controlled with a low sill with wetland plantings and an opening at the apex of the point for water access and a view of the James River.
- Along The Thorofare, management strategies include a combination of sills, spurs, and breakwaters designed to protect archaeological sites and enhance existing headland features.

Methodology

Proposed actions related to the Jamestown Project would not impact the James River shoreline. Impacts are assessed only for the shorelines of Powhatan Creek, Sandy Bay, and Back River. The analysis is based on a review of existing data for the project area and shorelines in similar geomorphic settings, including the *Shoreline Management Plan* (Hardaway et al. 1999) and recent scientific literature. In order to determine the level of impact intensity, the following definitions for negligible, minor, and major were used:

Negligible: An action that would have a very small impact on the shoreline. The consequences of such action would have no measurable effect on the shoreline.

Minor: An action that would have a small but measurable impact on the shoreline. The results would require scientific effort to measure and would include subtle changes in shoreline profile, nearshore slope, and vegetation along the shore. It would be difficult to determine whether such changes were a result of natural forces or the effects of the action alternative. Minor impacts also include those that are short-term in nature.

Major: Impacts resulting from actions with significant effects on the shoreline. Such effects would be permanent, would clearly be the result of the action alternative, would occur quickly, and could require mitigation and/or shoreline stabilization to minimize. Loss of land area and shoreline habitat or wetland area at the land/water interface could result.

Effects of Alternative A (No Action)

Currently there is no legal boat access within Jamestown Island and Colonial NHP; however, existing boat traffic on the waterways would be expected to maintain at or increase above its current level, and the Jamestown Explorer would continue its tour route. Boat wake would contribute to shoreline erosion along unprotected portions of Powhatan Creek, Sandy Bay, and Back River. This effect could be lessened by setting speed limits on these waterways to minimize wake, as well as continuing with plans to upgrade shore protection measures along these waterways. Because this alternative would maintain present conditions, its effects would be negligible. In addition, because plans to stabilize the shorelines along Powhatan Creek, Sandy Bay, and Back River are underway, any adverse effects would be short-term.

Impacts Common to the Action Alternatives

Construction within the RPA (see Section 4.3.2.2) would impact the riparian buffer and contribute to erosion along the shoreline. In each of the alternatives, a number of trees would be removed from the RPA to make room for new trails, and this would destabilize soils, as well as remove the

natural filtering system along waterways. Without proper mitigation, erosion along the shoreline and increased sedimentation into surface waters could be expected; however, special care would be taken throughout this project to ensure that shorelines are impacted as little as possible. This would be accomplished through strongly enforced construction erosion and sediment control plans, minimizing disturbance within the RPA, and supporting ongoing shoreline protection projects.

Effects of Alternative B

In order to support the boat tour/transportation service, three new boat docks would be constructed in this alternative, two on Back River and one at the mouth of Powhatan Creek. In addition, a bridge connecting Neck of Land to the Townsite would be constructed as part of the hike/bike trail. A bridge linked these areas in the 1930s, and construction of the new pile-supported bridge would reestablish the connection along a slightly different corridor. Construction of the pile-supported docks and bridge would constitute a direct impact on the shoreline (14,100 square feet), as vegetation would be removed for their placement. An erosion and sediment control plan would be implemented during construction to minimize damage to the shoreline and surrounding areas would be revegetated once construction was complete. Because this disturbance is limited in area and temporary, it would be considered a short-term, minor impact.

As noted above, an NPS-sponsored boat tour/transport service would be routed through Back River, Sandy Bay, and Powhatan Creek. Boat wake from this service would potentially impact eroding shorelines; however, plans to stabilize these shorelines and the setting of proper speed limits by the NPS would help to mitigate this impact. It would be difficult to distinguish damage to the shoreline caused by boat wake from natural erosion. This would therefore be a minor impact.

Effects of Alternative C

Alternative C also includes the NPS-sponsored boat tour/transport service and construction of three new boat docks. There would be construction disturbance to the shoreline in the areas of the three docks (approximately 11,350 square feet). Trees and vegetation would be removed for placement of the pile-supported structures; however, these areas would be revegetated as much as possible with marsh grasses once the docks are in place, and an erosion and sediment control plan would help to minimize construction impact. The temporary impact would be considered short-term and minor.

As in Alternative B, the boat service could increase erosion rates along already eroding shorelines by increasing wake within Back River, Sandy Bay, and Powhatan Creek. Speed limit controls and implementation of the recommendations set forth in the *Shoreline Management Plan* (Hardaway et al. 1999) would help to minimize this minor impact.

Effects of Alternative D

Alternative D would have negligible impacts to shorelines. This alternative does not propose a boat tour or transport service; therefore no new docks would be constructed. Only the existing Jamestown Explorer tour and other normal boat traffic would affect the shoreline, and NPS could mitigate the impact of these boats on its shores by posting and monitoring speed limits that minimize wake, as well as implementing the recommendations in the *Shoreline Management Plan* (Hardaway et al. 1999).

Effects of Alternative E

Alternative E also calls for construction of new boat docks to support a boat tour/transport service; however, in this alternative only two would be built, both on Back River. A bridge across Powhatan Creek from Neck of Land to the Powhatan Creek Overlook would also be constructed as part of the hike/bike trail. Total impacts to the shoreline of these structures would be approximately 5,000 square feet. As in the other cases of dock construction, these would be pile-supported and would require vegetation removal. An erosion and

sediment control plan would help to reduce runoff into waterways and protect the shoreline, and revegetation would occur to the furthest extent possible following construction. The impact of dock construction on the shoreline would be minor and short-term.

In addition, the proposed boat tour/transport would increase and concentrate boat wake that could lead to shoreline erosion along the banks of Back River. Again, posted speed limits and construction of shore protection measures would help to reduce the impacts of increased wake to minor.

Cumulative Impacts

The shorelines along Jamestown Island are eroding, and to combat this, the *Shoreline Management Plan* (Hardaway et al. 1999) proposes shoreline protection measures that would help stabilize shorelines throughout the Jamestown Island area. As described above, the NPS is preparing to install shoreline stabilization structures along the shorelines of Powhatan Creek, Back River, and Sandy Bay. These structures would serve to protect the shoreline from further erosion, thereby preventing damage to valuable cultural resources as well as loss of land. A combination of breakwaters, sills, and spurs has been chosen that, along with marsh grass plantings, would establish some beach areas to serve as a natural buffer to wave action.

Conclusion

Once the shoreline protection project proceeds, the action alternatives would have little overall effect on the shorelines; however, Alternative B proposes the most water-dependent venues and therefore would have the greatest impact on the shoreline. As noted, this impact would still be considered minor. Alternative D, on the other hand, would construct no docks or hike/bike bridges, nor would it provide a boat service as part of the multimodal transportation plan. Alternative D, therefore, would have the least impact on the shoreline.

Because none of the alternatives would cause a major impact to the shoreline, they would not result in impairment of this valuable natural resource.

Hydrodynamic Setting

As discussed in “Chapter 3: Affected Environment,” the hydrodynamic setting of Jamestown Island can be discussed with respect to four general conditions: wind-driven waves, sea-level rise, tides and storm surge, and wave action generated by boat wake. Wind-driven waves dominate the coastal processes of the James River shorelines due to the relatively long fetch exposures. Similar conditions influence The Thorofare, although the fetch exposure is limited primarily to the east and southeast. Moving upstream from The Thorofare, the channels of Back River and Powhatan Creek are relatively narrow and, as a result, the influence of wind-driven wave action is greatly diminished as compared to the open waters of the James. Along these water bodies, boat wake may have more influence on shore erosion. Sandy Bay is a protected embayment where both wind-driven waves and boat wake have equal influence.

Tidal currents within the narrow channels of Back River and Powhatan Creek play a major role in sediment transport, creating channel morphology consisting of primary channels and shoals. Storm surge influences super-elevate the tides above normal range and result in flooding of lower lying areas for the duration of the storm events. Sea-level rise influences the Island through progressive inundation of low-lying areas at a very slow rate.

The shoreline activities with the most potential to influence the hydrodynamic environment include the installation of various erosion control strategies as presented and evaluated in the *Draft Environmental Assessment of the Shoreline Management Plan Colonial National Historic Park, Jamestown Island, Virginia* (COE 2000). Generally, the structures and sand fill proposed by this plan would be beneficial to the long-term stability and coastal ecosystem of the Island. These structures, as noted previously, would also help minimize the impacts of the Jamestown Project.

Methodology

The potential impacts of the various Jamestown Project development alternatives on hydrodynamic conditions are discussed in the following paragraphs. Impact indicators are similar to those presented under “Shoreline and Nearshore Environment.” Therefore, the same definitions for negligible, minor, and major will be used.

Effects of Alternative A (No Action)

Under Alternative A, the No Action Alternative, influences of wind-driven waves, sea-level rise, tides, and storm surge and boat wake would be expected to continue as currently observed.

Impacts Common to the Action Alternatives

Wind and Wave Climate

The wind and wave climate affecting Jamestown Island would not change as a result of the action alternatives. Proposed changes would not affect or increase the exposure of facilities or infrastructure to the predominant wind direction and associated wave impacts.

Sea-Level Rise

EPA estimates indicate that subsidence and global warming may cause sea level to rise in the Chesapeake Bay another 8 inches by 2025, 13 inches by 2050, and 27 inches by 2100 compared with the level in 1990 (2001). A sea-level rise of this magnitude in the year 2100 would impact all alternative action plans in the same manner. In general, all alternatives would be equally affected by substantially higher (27 inches) water elevations and an associated retreat of the shoreline. The impacts would be most apparent at the shorelines and wetland areas that are currently between the 0 and 3 foot elevations; however, increased frequency of inland flooding can be expected if sea-level rise is combined with storm surge elevations. For example, the COE reports a storm surge elevation of 6.0 feet for an event with a 10-year return interval (1997). When combined with sea-level rise, this storm surge

would be approximately 8 feet, exceeding the elevation of what is now a storm with a 50-year return interval and closely corresponding with the elevation of what is now the 100-year event (8.5 feet). The impact of this condition would be lessened by construction of all structures at elevations above the 500-year floodplain, which is estimated by the Federal Emergency Management Agency (FEMA) to be 9.8 feet. Existing and proposed stormwater management systems would be adversely affected due to the loss of drainage potential (a decrease in the overall hydraulic gradeline) and, possibly, direct inundation. The existence of global warming may increase the amount of sea-level rise; however, global warming is still a topic of debate among many scholars and scientists.

While difficult to estimate, it is likely that increases in sea level may also result in gradually increasing wave heights, and therefore increased magnitudes of sediment transport and shore erosion. This is due to the relative increase in offshore water depths that may enable the generation of larger waves over a long period of time. The potential for this long-term change in wave conditions resulting from increased water depths, may be offset by gradually increasing sedimentation, particularly in the nearshore zone. Provided deposition occurs concurrently with sea-level rise, the net result would be a landward displacement of the shoreline, while maintaining nearshore water depths that are similar to those experienced today.

Tides/Storm Surge

Tides would not be influenced by any alternative action plans. Proposed alternative plans would still experience semi-diurnal tides consisting of two high tides and two low tides each day with average tidal range of 2.60 feet and spring tide range of 2.90 feet. Tidal fluctuations would be in addition to any increase in mean sea-level elevation over the years. Normal high tides in the year 2100 could be expected to reach close to the existing 5-foot contour.

Storm surge elevations have been estimated by the COE to range between 6.0 feet for a 10-year event and 9.6 feet for a 500-year event. (FEMA estimates 9.8 feet for this event.) Storm surges of these magnitudes would flood much of the lower lying lands of Jamestown Island and segment the proposed improvements until the tides resumed normal fluctuations. Following the passage of a hurricane or nor'easter, the storm surge is released as an ebb surge. In certain conditions, the ebb surge may be channeled through low areas between structures and may cause increased velocity, scour, and sediment transport (Milligan and Hardaway 1996). These impacts are associated with particular types of development, particularly where streets and beach access roads channel water perpendicular to the adjacent water body. For example, gaps between buildings, such as condominiums and hotels at Myrtle Beach, South Carolina, concentrated surge ebb flow and resulted in accelerated offshore sediment transport (Gayle 1991). In the case of Jamestown Island, the proposed improvements tend to be fairly spread out and impacts associated with surge ebb flows would be negligible.

Boat Wake

In general, boat wakes have only a minimal effect on shoreline erosion when compared to the effects of wind-generated waves; therefore, associated impacts along the shorelines are expected to be minor. However, in narrow channels protected from wind-generated waves, such as within Back River, boat wake would have a greater effect.

Overall, there are no major impacts to hydrodynamics as a result of the action alternatives. Under Alternatives B, C, and E, which have boat service between two or three proposed docks, boat wake would result in minor impacts on existing hydrodynamics. The minimal wake impacts would be the same for Alternatives B and C and slightly less for Alternative E because the Powhatan Creek Overlook boat dock is eliminated under this alternative.

In addition, recreational boaters and boaters traveling to and from the nearby Jamestown Marina currently use the waterways within the Jamestown Project site. Based on observations by NPS staff, the operator of the Jamestown Explorer, and the owner of the Jamestown Marina, the addition of a boat service would result in a minor increase in the overall boat traffic. Increased boat traffic resulting from the service would increase wake activity along the affected shorelines, particularly between Jamestown Island and Neck of Land; however, it is not anticipated to cause measurable shoreline erosion impacts because a typical vessel used for this service is small (<50 feet), has shallow draft, and travels at slow speeds. Further, due to the seasonal nature of the boat traffic, and particularly of the NPS-sponsored boat tours and/or transport, there would be no impacts from December through March when boat traffic is sparse and tours are not offered. Stabilization of the shorelines along these reaches as proposed in the *Shoreline Management Plan* (Hardaway et al. 1999) would also negate any impacts a boat tour might otherwise cause.

Effects of Alternative B

One element of Alternative B that would be expected to influence hydrodynamic conditions at Jamestown Island includes the construction of three boat docks at Neck of Land, Jamestown Island, and Powhatan Creek Overlook. These structures would be used by a pontoon-type vessel for transporting visitors within the park. Direct impacts to the hydrodynamic setting could be expected due to subtle changes in nearshore current conditions as flood and ebb tides encounter the newly constructed open-pile facilities. Secondary impacts could occur due to local and periodic increases in turbulence resulting from propeller thrust and through minor increases in boat wake. Each of these types of impacts would be minor and relatively insignificant when compared to the current level of boat traffic that moves through the channels toward upriver public marinas and private piers located on Powhatan Creek.

A second feature of Alternative B that may influence hydrodynamic conditions is the proposed hike/bike trail extending from Neck of Land to Jamestown Island. This walkway would be on existing asphalt surface for approximately 600 feet, before transitioning to an open pile boardwalk and bridge. Both structures would create subtle changes in the flow conditions in the area during and following storm surge events. These structures could also function to trap floating debris brought into the area on super-elevated flood tides.

Effects of Alternative C

Alternative C includes the same three boat docks proposed in Alternative B, and the associated influences on the hydrodynamic conditions are expected to be the same. No other aspects of Alternative C would affect the hydrodynamic setting of Jamestown Island.

Effects of Alternative D

Alternative D does not include any proposed construction within the James River, The Thorofare, Back River, Sandy Bay, or Powhatan Creek.

Effects of Alternative E

The project elements of Alternative E are similar to those of Alternative B, however only two boat docks are proposed and the hike/bike trail across the tidal marsh surrounding Neck of Land heads west toward Powhatan Creek Overlook. While the number of docks and bridge location is different than in Alternative B, the impacts to the hydrodynamic environment would be generally the same.

Cumulative Impacts

The Jamestown Explorer, a boat tour, operates from Jamestown Marina and passes through the Isthmus into the James River several times each day. The NPS-sponsored boat service would add to the impacts of the Explorer by following the same route multiple times per day.

The *Shoreline Management Plan* (Hardaway et al. 1999) calls for stabilization of shorelines throughout

the study area, not only to prevent further erosion, but also to protect cultural and natural resources on the Island. Implementation of this plan would offset fears of shoreline erosion created by adding a boat service in several of the alternatives for this project.

Conclusion

Alternatives B and E would have the greatest impact on the hydrodynamic environment – boat service, docks, and a boardwalk trail and bridge would be added and would influence the hydrodynamic setting of the Island. The impacts of Alternative C would be similar, but lessened based on the specific attributes of the alternative. Alternative D would have virtually no impact to hydrodynamics. Because there would be no major impacts as a result of the alternatives, none would result in impairment of hydrodynamic resources.

Water Quality

This section analyzes the impacts of each of the action alternatives on the quality of surface waters surrounding Jamestown Island, including Powhatan Creek, Back River, Sandy Bay, and the James River. The Jamestown Settlement and private landholders control upstream areas, and the Jamestown Settlement is planning expansion and construction in preparation for the 2007 celebrations. However, their plans have not been discussed with NPS or APVA staff. It is assumed that private development surrounding Jamestown Island would continue, but it is unknown to what extent this would occur.

Methodology

A water quality standard defines the water quality goals of a water body by designating uses to be made of the water, by setting minimum criteria to protect the uses, and by preventing degradation of water quality through anti-degradation provisions. Anti-degradation should not be interpreted to mean that “no degradation” can or will occur, as even in the most pristine waters, degradation may be allowed for certain pollutants as long as it is temporary and short-term.

In order to assess the magnitude of water quality impacts to surface waters under the various alternatives, state water quality standards were examined and compared to baseline water quality data, where available. If existing water quality data was unavailable, general assessments were made related to the proposed actions and the relative change in water quality, in particular increases to impervious cover. The following impact thresholds were established in order to describe relative changes in water quality:

Negligible: Impacts are chemical, physical or biological effects that would not be detectable, would be well below water quality standards or criteria, and would be within historical or desired water quality conditions.

Minor: Impacts (chemical, physical, or biological effects) would be detectable and measurable but would be well below water quality standards or criteria and within historical or desired water quality conditions.

Moderate: Impacts (chemical, physical, or biological effects) would be detectable and measurable but would be at or below water quality standards or criteria; however, historical baseline or desired water quality conditions would be altered on a short-term basis.

Major: Impacts (chemical, physical, or biological effects) would be detectable and would be frequently altered from the historical baseline or desired water quality conditions, and/or chemical, physical, or biological water quality standards would be slightly and singularly exceeded on a short-term basis.

Effects of Alternative A (No Action)

Powhatan Creek is designated as a sensitive watershed. There would be no construction at Jamestown Island and no changes in existing impervious cover (approximately 21.5 acres); therefore, there would be no contribution to

increased siltation or runoff into Powhatan Creek or other waterways. However, much of the APVA and NPS development at Jamestown occurred prior to the implementation of regulatory standards, and runoff would continue uncontrolled and unmitigated. Cumulative impacts to surface water quality within project boundaries could also be expected from continued development upstream.

Impacts Common to the Action Alternatives

Construction

Construction activities throughout the project site would result in short-term adverse impacts to water quality near the construction sites. Construction would lead to loss of vegetation and the potential for erosion and an increase in suspended solids in streams. Strong and monitored erosion and sediment control measures throughout the construction process would be mandated and should help to minimize this temporary impact. These would include minimizing the time that soil is exposed, diverting runoff to grassed areas, installing temporary erosion controls, stabilizing disturbed soils, and dissipating runoff across the site. Utility-related excavation would be inevitable on Jamestown Island with construction of new exhibits, research facilities, and restrooms. Excavation of trenches for utilities would necessitate removal of vegetation, leading to exposure of soils to erosion. Trenches also would create the potential for ponding of water downslope of the trench, as well as other alterations of surface and/or ground water flow. Utility lines should be located away from water resources and steep slopes to minimize erosion.

Trails

New trails would be constructed throughout the Island (although the extent varies by alternative). Trail construction would require clearing of vegetation, which would cause disruption of the soils and erosion. In addition, trail construction and maintenance would require the use of

chemical herbicides, which could be washed into surface waters. Best management practices would be employed during construction, and trails would be designed to align with natural contours to control runoff. The use of hard, permeable surfaces to hold soil in place would also be an option for trails.

Concentrated visitor use of trails would result in on-going erosion, and long-term compaction of soils could result in channelized runoff, scouring of soil, and deposits of sediment into streams during storm events. Inappropriate visitor access could result in trampling of streamside vegetation, removing the natural filtering mechanism for runoff and causing degradation of water quality. The natural development of “social trails,” caused by visitors walking in areas adjacent to trails, would cause increased soil disturbance and erosion of suspended solids into surface waters. These social trails could be minimized by appropriate trail design that prevents off-trail hiking, educational signs, and increased park ranger presence. They also would be discouraged by seasonal discomforts such as ticks, high water, and dense vegetation.

Parking

Parking lot improvements, as well as construction of additional structures, are proposed in each alternative. Changes in impervious cover area would affect runoff of sediments and pollutants to surface water. In all alternatives, the parking lot at Glasshouse would be reconfigured to accommodate 55 cars and 6 buses; however, there would be no increase in the total amount of impervious cover in this area.

Mitigative measures would be taken to reduce petroleum and stormwater runoff from enlarged parking areas to protect surface waters. Runoff from the parking areas would be minimized by designing for retention of runoff, filtering surface pollutants, and minimizing impervious cover as much as possible. A stormwater collection and retention system for water quantity and quality

would direct filtered stormwater to existing marsh areas. BMP facilities, such as a marsh ponds, could also be constructed upstream of the existing marsh to ensure downstream water quality. The NPS would work closely with the Center for Watershed Protection to ensure that the most recent technologies are implemented.

Agricultural Site

Restrooms would be added at this proposed interpretive area. This would pose the threat of potential sewage leakage into soils, groundwater, and streams.

Effects of Alternative B

Alternative B calls for construction throughout the Jamestown Project site, including new buildings and parking at Neck of Land and the Townsite, as well as a hike/bike trail connecting Neck of Land and the Townsite by way of a new bridge across Back River. Approximately 8.2 acres of impervious cover would be added under this alternative.

Hike/Bike Trail Bridge

Erosion and sedimentation into Back River would result from construction of the bridge, but could be minimized with an erosion and sediment control plan. In addition, the bridge would shade surface waters and benthic communities beneath, an indirect impact to approximately 3,500 square feet (0.08 acres). The bridge should therefore be built at a height to allow angled light to reach the water's surface in order to minimize impacts to aquatic habitat.

Boat Docks

Boat docks would be constructed in the areas of the Townsite, Powhatan Creek Overlook, and Neck of Land. Construction of the docks and paths and utilities to the docks would have the same potential for erosion and sediment loading to the surface waters as other construction projects, and site-specific erosion and sediment control plans would be developed to protect surface waters surrounding these sites.

Additionally, the proposed interpretive boat tour/taxi would increase boat traffic in Powhatan Creek, Back River, and Sandy Bay, increasing boat-associated pollution, such as fuel, oil, and turbidity in surface waters. No fueling or changing of oil would be done on NPS property. Instead, these activities would be completed at an offsite location where the boats are stored. To reduce any potential increase in littering, signage and a fine would be installed.

The boat docks would also cover 10,500 square feet (0.24 acres) of open water. This would cause an indirect shading impact to underlying waters and benthic areas, thereby impacting the aquatic habitat. To minimize this effect, docks and decking should be constructed at an elevation that would allow angled light to reach and penetrate surface waters.

Parking

Several changes to parking at Jamestown are proposed in Alternative B. Modifications to the Parkway and parking space for 250 cars (phased 150, then 100) and 15 buses would be added at Neck of Land for the Intermodal Transportation Terminal in an area that is currently forested, increasing the amount of impervious surface in that part of the project site by approximately 4 acres. This would result in runoff of sediment and pollutants to surface waters in Back River. Stormwater measures would be put into place to accommodate increased runoff. These would likely consist of grass swales, small underground flexible pipes, and marsh ponds for water quality control. These features would not be seen from the Colonial Parkway, thus avoiding a potential viewshed impact on this resource.

Effects of Alternative C

Alternative C is similar to Alternative B in that it includes plans for construction of new facilities at Neck of Land and docks at three locations. Approximately 9 acres of impervious cover would be added in total.

Boat Docks

Construction of three boat docks and associated trails would have the same impacts described in Alternative B.

Parking

Approximately 5 acres of additional parking space for 300 cars and 25 buses would be added at Neck of Land resulting in increased pollutant and sediment runoff to Back River. As in Alternative B, a stormwater collection and retention system would help to protect surface water quality.

Effects of Alternative D

Alternative D includes no plans for new construction at Neck of Land. Additionally, no docks or bridges would be constructed. An increase in total impervious cover of approximately 4.5 acres on the Island would result under this alternative.

Effects of Alternative E

Alternative E plans include construction at Neck of Land and a hike/bike trail through the Neck of Land marsh. Impacts would be similar to those described under Alternative B. There would be an increase in total impervious cover of approximately 8.5 acres.

Hike/Bike Trail Bridge

The trail would consist of a boardwalk over the Neck of Land marsh and would pass over a new bridge across Powhatan Creek to Powhatan Creek Overlook. Bridge construction would result in sedimentation and runoff to surface waters and would be minimized with an erosion and sediment control plan. Additionally the bridge would shade the underlying waters (4,350 square feet or 0.10 acre), thereby affecting the aquatic environment. Constructing the bridge at a height that allows some angled light to penetrate to the water level below would mitigate this impact.

Boat Docks

Boat docks would be constructed at Neck of Land and at the Townsite, but not at the Powhatan Creek Overlook. Construction of the docks, and trails and utilities leading to the docks, would result in temporary increases in siltation and runoff into surface waters. This would be mitigated with a strong and enforced erosion and sediment control plan at each site. In addition, the docks would have an aerial coverage of approximately 3,000 square feet (0.07 acre) over open water, shading the water column and benthics beneath. Building the docks at an elevation that would allow angled light to reach the water would minimize this indirect impact to the aquatic habitat.

Parking

Parking area for 100 cars and 8 buses, encompassing approximately 3.5 acres, would be added at the new Neck of Land facility, increasing impervious cover in that area. To combat this, mitigation in the form of stormwater planning, grassed swales, and erosion and sediment control plans would be incorporated.

Cumulative Impacts

The Jamestown Settlement and private landholders control upstream areas, and the Jamestown Settlement is planning expansion and construction in preparation for the 2007 celebration. However, their plans have not been discussed with APVA or NPS staff. It can also be assumed that private development surrounding Jamestown Island would continue to increase, but it is unknown to what extent this would occur. However, implementation of the *Shoreline Management Plan* (Hardaway et al. 1999) with installation of shore protection structures would decrease the amount of sediments entering waterways from erosion.

A long term monitoring plan would also be implemented to monitor and maintain water quality. Using a combination of NPS staff, volunteers, student interns, and cooperative and

agency agreements, water quality would be monitored prior to, during, and after construction. Aquatic habitats would be evaluated regularly, and the NPS would monitor the effects of boat traffic on shorelines, marsh health, and water quality.

Conclusion

Construction in all alternatives would have the potential to degrade surface waters through increased siltation and runoff, and increases in impervious cover and decreases in forested vegetation resulting from each of the alternatives would have similar results. Because Alternative D does not include buildings or a parking area at Neck of Land, construction of a walkway through the marsh, or boat docks, it would impact surface waters the least. Alternatives B, C, and E would each potentially impact surface waters adversely; however, mitigative measures taken to minimize these potential impacts would include strong and monitored erosion and sediment control plans, innovative stormwater management, careful design planning, and long-term environmental monitoring. To limit spills during construction, response plans and construction monitoring would be implemented. In addition, the APVA and NPS would continue to work with the Center for Watershed Protection to define state-of-the-art technologies to deal with runoff pollution. Because of the strong measures that would be taken, no impairment to surface waters would result from any of the action alternatives.

4.3.2.4 Floodplains and Flood Zones

Floodplains are lands adjacent to freshwater streams and rivers that receive floodwaters when water has overtopped the bank of the main channel as a result of a higher than normal influx of upstream water supplies. Floodplains are important resources in the storage and filtering of these floodwaters. Without proper mitigation, construction within the flood zone can result in direct long-term impacts, including a decrease in flood storage volumes, the restriction of natural flow patterns, and the exasperation of catastrophic flooding in upstream areas where the flow of water has been constricted.

In contrast, a flood zone is an area subject to the risk of flooding regardless of the type of flooding. A flood zone includes floodplains where water crests the banks of channels as well as coastal land with low elevations subject to tidal storm surges. Flood zones affected by tidal surges are locations where water is actually pushed up from sea level to an elevation much greater than the mean high tide due to extremely high winds.

The James River at the location of Jamestown Island has an average water elevation approximating sea level, whereby sea level is viewed as having an infinite flood storage capacity. It can safely be assumed, therefore, that the Jamestown Island area is not subject to flooding as a result of water cresting the banks of the James River due to upstream influxes. For this reason, none of the proposed alternatives would truly affect floodplain values.

However, flooding as a result of a tidal storm surge is a more likely scenario. Principle concerns with tidal storm surges include the flooding and distribution of toxic materials and severe erosion exacerbated by structures constructed on unstable soils. Flood storage capacity is not a relevant issue because work within the flood zone would not adversely affect the flooding potential of other properties, as does a fluvial floodplain.

Methodology

FEMA has identified approximately 1576 acres (roughly 87%) of Jamestown Island as a flood zone having the probability of flooding as a result of a storm surge 1 out of every 100 years (elevation 8.5 feet). Additionally, approximately 63 acres are identified as being within the 500-year flood zone (elevation 9.8 feet), subject to flooding at least once in 500 years (see Figure 3-13).

The *NPS Floodplain Management Guideline* requires that structures and facilities within the flood zone be designed so as to be consistent with the intent of the Standards and Criteria of the National Flood Insurance Program (44 CFR 60). Structures must have professionally engineered flood-proofing measures to

manage flood hazards. In addition, flood warning and evacuation plans must be designed and determined to be adequate to manage flood hazards.

The guideline does not apply to actions that are functionally dependent on water, including docks, piers, bridges, and boardwalks to interpret wetlands. The guideline also does not apply to certain park functions that are often located near water for the enjoyment of visitors, such as scenic overlooks, foot trails, and associated daytime parking. In addition, entrance, access, and internal roads to or within units of the NPS are exempt from the management guidelines, as are historic or archaeological sites or artifacts whose location is integral to their significance. Because these activities are exempt from regulations, their impact is considered negligible.

Actions that are not exempt from the *Floodplain Management Guideline* must be analyzed in a Statement of Findings (SOF) for Floodplains (see Appendix K). The SOF summarizes impacts to the floodplain, reasons for using the floodplain, and mitigation. A final, signed SOF will be included with the ROD.

The following terminology is used in describing impacts to the floodplains and flood zones:

Negligible: The impact would have no discernible effect on the flood storage capacity of the floodplain or flood zone, or the action is exempt from NPS floodplain regulations under the *NPS Floodplain Management Guideline*.

Minor: The action would take place within the floodplain or flood zone, but would not result in an increase in potential flood damage to other areas.

Moderate: The action would take place within the floodplain or flood zone and would result in increased potential for flood damage at the project site.

Major: The action would have a measurable impact on potential flood damage to the site as well as adjacent and downstream properties.

Effects of Alternative A (No Action)

Alternative A would not include any new structures, fill, or alterations to the flood zone areas. The two most significant issues regarding the potential for flooding would be the existing collections storage area located in the basement of the Visitor Center and low floor elevations at the Glasshouse and the Dale House. The basement level of the Visitor Center is below the 100-year flood zone elevation, and the floors of the Glasshouse and Dale House are also below elevation 8.5 feet and are therefore under threat of a 100-year flood event. Flooding of these structures does not necessarily pose an environmental threat, but damage to structural features and the potential to lose valuable collections would likely occur; therefore, the impact of flood damage would be adverse and moderate. The floors of the other existing buildings are above the 100-year flood zone elevation. Flooding of other existing features such as roads and parking facilities would not have adverse impacts to the environment.

Impacts Common to the Action Alternatives

All action alternatives would result in some physical improvements becoming inundated by a catastrophic storm surge. However, no measurable impacts to the flood zone would result from any of the alternatives.

The Dale House, located entirely within the 100-year flood zone, would undergo interior renovation. In Alternatives B, C, and E, refreshments would be provided at the Dale House (either for visitors or staff, depending on the alternative), while in Alternative D, it would remain in its current use as an exhibit and workspace for the APVA. The Dale House building is 3,000 square feet with a floor elevation of 6.6 feet. Any renovations to the building would be designed so as to be consistent with the Standards and Criteria of the National Flood Insurance Program. In addition, flood warning and evacuation plans would be designed.

Interpretive anchors would be constructed at the east and west ends of the historic site. The Ludwell exhibit facility would anchor the west end, and the Agricultural exhibit area would be the eastern anchor. Both exhibits would be located entirely within the

100-year flood zone; however, the floor level of the 7,500 square-foot Ludwell Facility would be raised above the flood zone. The Agricultural exhibit would contain only a temporary facility, but because the primary flood hazard to Jamestown Island is storm surge, NPS staff should have sufficient warning to remove or stabilize this structure prior to flooding. However, as a mitigating step, both structures would be constructed based on design criteria of the National Flood Insurance Program and would include flood warning and evacuation plans.

In addition, any new structure proposed by the action alternatives would be designed using the criteria of the National Flood Insurance Program, would include flood warning and evacuation plans, and would be structurally sound to withstand hurricane-type winds and storms.

Effects of Alternative B

Alternative B proposes parking and structural features on Neck of Land, adjacent to the Colonial Parkway; however, a portion of the new parking area would be constructed in the 100- and 500-year flood zones. Signs could be placed in this area to warn of the potential hazard, should it be deemed necessary.

Portions of the existing Visitor Center now extend into both the 100- and 500-year flood zones. Renovations to the Visitor Center would be proposed under this alternative in order to create the Observation Building. The existing building would be substantially downsized from 29,000 square feet to approximately 5,000 square feet, and that portion of the building within the flood zones would be removed resulting in the entire, new facility being outside of the flood zones.

A replacement Visitor Center/Educational Facility would be located in the existing Island parking lot, out of the 100-year flood zone. Additionally, approximately 8,000 square feet would be added to the existing Jamestown Rediscovery™ Center. The existing floor level of the Jamestown Rediscovery™ Center is at 10.15 feet, and the addition would match with this, above the 100- and 500-year flood zones. As

with all new construction at Jamestown, precautions would be taken to ensure that the buildings would be structurally able to withstand flooding. Structures would be consistent with National Flood Insurance Program standards, and flood warning and evacuation plans would be prepared.

Other improvements, such as the hike/bike trail and boat docks, would be constructed within the 100-year flood zone; however, these structures would not increase the potential for flooding. As flooding of these features would not have adverse impacts to the environment, they have been exempted from the *NPS Floodplain Management Guidelines*; however, docks and raised boardwalks could break apart or trap debris in a flood or storm surge. As a precautionary measure, any impacts from construction of the trail and docks would be mitigated by appropriate structural design and flood warning systems.

In total, 0.89 acres of new buildings and parking lots would be constructed or renovated within the 100-year floodplain, along with 0.10 acres of bridges, 0.86 acres of boardwalks, 0.08 acres of docks, and 0.51 acres of trails. The impacts of each of these structures would be minor. Further, 0.37 acres of currently disturbed area would be returned to vegetation, a minor beneficial impact to flood storage capacity.

Effects of Alternative C

Alternative C would include boardwalk features within the 100-year flood zone at Neck of Land and parking areas within both the 100- and 500-year flood zones. Flood warning signs could be posted here. Additionally, an Intermodal Transportation Terminal (2,000 square feet) would be constructed above the 500-year flood zone elevation.

As noted under Alternative B, the existing Visitor Center would be modified from 29,000 square feet to 5,000 square feet to house the new Observation Building. This modification would move the building out of the 100- and 500-year flood zone.

A ticketing facility (1,000 square feet) would be constructed in the existing Island parking lot. This building would be located above the 100-year flood zone. The Jamestown Rediscovery™ Center would remain unchanged, with a floor elevation of 10.15 feet, which is 1.65 feet above the 100-year flood zone.

The boat docks would be constructed below the 8.5-foot elevation. Again, because these structures do not pose concerns of toxicity and would be constructed on stable, vegetated soils, the flooding of these features would not cause serious concern to the environment, and they are exempted from the *NPS Floodplain Management Guideline*. Possible impacts would be mitigated through structural design considerations and flood warning systems.

In total, 0.84 acres of new buildings/parking lots would be constructed or renovated within the 100-year flood zone, along with 0.34 acres of boardwalks, 0.08 acres of docks, and 0.39 acres of trails, resulting in minor impacts. Further, 0.37 acres of currently disturbed area would be returned to vegetation, a minor beneficial impact to flood storage capacity.

Effects of Alternative D

The existing Visitor Center would be modified to include an educational facility and the Observation Building. Keeping the basic footprint of the building, the structure would be three stories high, with 10,000 square feet per level. The Visitor Center's main level would be above the 100-year flood zone; however, the basement would remain within the 100-year flood zone. Collections and other sensitive archives would be removed from the basement and stored above the 100-year flood elevation. Any new construction or modification to the building would be subject to the standards of the National Flood Insurance Program, and the building would have a flood warning and evacuation plan.

Alternative D proposes no Neck of Land construction, and as in Alternative C, the Jamestown Rediscovery™ Center would remain unchanged.

As in other alternatives, hike/bike trails and walkways would be added throughout Jamestown Island, within the 100-year flood zone. These features, however, would not impact the flood zone by increasing flood potential, and in the event of a storm surge, no environmental damage would result from flooding of these features. A flood-warning plan would be developed, and construction of the trails and boardwalks would comply with National Flood Insurance Program recommendations.

Overall, 0.16 acres of new buildings and parking lots would be constructed or renovated within the 100-year floodplain, along 0.36 acres of boardwalks and 0.14 acres of trails. The impacts of each of these structures would be negligible.

Effects of Alternative E

As in Alternative B, an Intermodal Transportation Terminal (2,000 square feet) and parking would be constructed at Neck of Land. The building would be above the level of the 500-year flood zone, while portions of the parking lot would be constructed in the 500-year flood zone.

The existing Visitor Center would be downsized from 29,000 square feet to approximately 2,500 square feet, removing it from the 100- and 500-year flood zones, to accommodate the new Observation Building. A replacement Visitor Center/Educational Facility (approximately 19,000 square feet) would be located in the existing Island parking lot, above the 100-year flood zone. New construction and remodeling would be in compliance with requirements of the National Flood Insurance Program, and flood warning and evacuation plans would be prepared for all buildings.

Alternative E calls for construction of hike/bike trails and boat docks throughout, which would be constructed within the 100-year flood zone. The flooding of these features would not cause environmental harm, and they are exempted from the *NPS Floodplain Management Guidelines*. Structural construction precautions and flood warning systems would be put into place.

Under Alternative E, 0.45 acres of buildings/parking lots would be constructed or renovated within the 100-year floodplain, along with 0.05 acres of bridges, 0.82 acres of boardwalks, 0.04 acres of docks, and 0.45 acres of trails. The impacts of each of these structures would be minor. Further, 0.42 acres of currently disturbed area would be returned to vegetation, a minor beneficial impact to flood storage capacity.

Cumulative Impacts

In many instances, an increase in impervious surfaces can result in a higher volume of stormwater runoff and increased runoff rates discharging to floodplains and associated watercourses. This could have the affect of flooding downstream properties that are normally immune to flooding. Development upstream of the Island could therefore affect potential flood damage at Jamestown. Stormwater runoff on Jamestown Island, however, would not result in flooding of downstream areas since the discharge point is at sea level and has an infinite flood storage capacity.

Conclusion

In summary, none of the proposed alternatives would affect floodplain values because the rivers adjacent to the project site are at sea level; however, large portions of the site are at risk of coastal storm surge flooding. This would temporarily inundate permanent improvements associated with any of the alternatives, such as roads, parking lots, and hike/bike trails. Because these improvements are permanent, stable features made from non-toxic materials, flooding of these improvements would not cause direct environmental harm or result in harm to other properties. While new structures would generally be raised above the 100-year flood zone, a hurricane preparedness plan would minimize harm to the environment, including proper storage and protection of chemicals, paints, and other substances, as well as an evacuation plan.

Because none of the alternatives would result in major impacts to floodplains, impairment of this resource would not occur. Table 4-8 contains a complete list of impacts to the 100- and 500-year flood zones.

	Zone	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
New Building/Parking	100-year	—	0.89	0.84	0.16	0.45
	500-year	—	0.72	0.62	0.07	0.31
Trail	100-year	—	0.51	0.39	0.14	0.45
	500-year	—	0.13	0.09	0.03	0.15
Dock and Associated Decking	100-year	—	0.08	0.08	—	0.04
	500-year	—	—	—	—	—
Boardwalk	100-year	—	0.86	0.34	0.36	0.82
	500-year	—	0.03	0.03	0.02	0.03
Bridge	100-year	—	0.10	—	—	0.05
	500-year	—	—	—	—	—
Unpaved Surface	100-year	—	0.12	0.10	0.09	0.09
	500-year	—	—	—	—	—

4.3.2.5 Wetlands and Deepwater Habitat

Wetlands within and surrounding the project area have been described in “Chapter 3: Affected Environment.” One common feature of all the alternatives is the proposal to impact only tidal wetlands: no non-tidal wetlands would be affected by the proposed actions. The differences in the alternatives lie in the placement of the hike/bike trail and boat docks. The most significant differences are with the hike/bike trail: Alternatives B and E both have the hike/bike trail at different locations within the tidal marsh. Alternatives C and D, however, do not call for a hike/bike trail across Neck of Land.

Impacts to wetlands have been evaluated in the context of the type of impact and the importance of the resource based on the functional values assessment described in Chapter 3. For purposes of this analysis, impacts were categorized as indirect and direct. **Indirect impacts** include work that would result in temporary damage to vegetation due to construction or the restricted access to sunlight due to shading (i.e. pile supported structures). **Direct impacts** include those activities that would result in the conversion of a wetland community to upland as a result of fill material for man-made structures (i.e., road). **Secondary impacts** are not directly attributable to the structure proposed in the wetland, such as noise, pollution, or increased wave action.

Again, all impacts associated with each alternative are proposed within tidal wetlands. Therefore, the degree to which an impact affects the wetlands has been categorized according to acreage thresholds and the type of impact (direct or indirect). The following terms shall be used when applicable in this section:

Negligible: Work would cause indirect impacts only.

Minor: Work would cause the direct impact of less than 1 acre of wetlands within the Jamestown Project site.

Moderate: Work would cause the direct impact of between 1 and 10 acres of project wetlands.

Major: Work would cause the direct impact of over 10 acres of project wetlands.

Figures 4-1 through 4-11 (located previously in this chapter) depict the impacts to delineated wetlands within the Jamestown Project site.

Effects of Alternative A (No Action)

Alternative A, the No Action Alternative, calls for no additional structures or improvements; therefore no direct impacts to wetlands would result. However, no stormwater management devices would be added, and runoff and erosion would continue to flow uncontrolled into wetlands and waters of the United States. Therefore, secondary impacts would continue to occur. Overall impact would be negligible.

Impacts Common to the Action Alternatives

Each alternative calls for the construction of a new footbridge from the Jamestown Island parking lot to the modified Visitor Center or Observation Building. In each alternative, the new footbridge would result in indirect impacts to vegetated wetlands by shading areas beneath. Constructing the footbridge high enough to allow sunlight penetration (which the existing footbridge does not do) would minimize this impact. The raised footbridge would also result in minor impacts to the wetlands at the location of the supporting piles. The enhancement of marsh due to the removal of the existing footbridge across Pitch and Tar Swamp would help to partially offset impacts caused by the new footbridge location. In addition, the NPS would use top-down construction for driving piles in wetland areas. While this method is more expensive than traditional pile driving, it is also less environmentally intrusive. Traditional pile driving requires heavy machinery within the marsh for construction causing temporary disturbance, as well as long-term compaction.

Each alternative, including the No Action Alternative, would include the underground extension of a water main and sewer line to the Jamestown Rediscovery™ Center. By regulation, the water main must always remain a minimum of 10 feet from the sewer line. This would require the trenching of two separate corridors, one for each line. Trenching would be done with a small backhoe using a ±1-foot wide bucket at a depth of approximately four feet. The extensions would begin at a connecting point with the existing lines immediately adjacent to the Colonial Parkway entrance to the Jamestown Island parking lot. The lines would traverse south through the upland forest until they connect into the existing APVA service road. At this point, one line would be installed along the left road shoulder, and the other line would be installed along the right road shoulder, approaching Pitch and Tar Swamp. At the point where the road crosses the swamp, the width of the roadbed would provide enough space to allow installation of both utility lines without dredging or filling in wetlands and maintaining the required 10-foot wide spacing.

Also at the Jamestown Rediscovery™ Center, all action alternatives include expansion of the existing parking. This would result in 0.03 acres of direct impact to an isolated, non-jurisdictional wetland. This wetland is of minimal value and has possibly formed due to the sanitary drain field located below it. Once the APVA property is connected to public water and sewer, this drain field would be removed because it is located within 100 feet of Pitch and Tar Swamp, and therefore within the RPA. The act of removing the drain field would also directly impact the isolated, non-jurisdictional wetland.

Effects of Alternative B

Besides the 0.03 acres of direct impact to a non-jurisdictional wetland, no direct impacts to jurisdictional wetlands would result from work proposed in Alternative B, and indirect impacts (not permanently lost, but covered) would total 0.80 acres. An additional 0.07 acres of elevated structures

would be installed over open water (deepwater habitat). Overall impact to wetlands (both jurisdictional and non-jurisdictional) would therefore be minor.

Most of Alternative B's indirect wetland impacts would be associated primarily with a pile-supported hike/bike trail and boardwalk leading to boat docking facilities. The hike/bike trail would traverse south through the tidal marsh on Neck of Land toward Back River. Initially, the trail would follow an existing roadbed southward, then would veer southeast across the marsh to allow a 900-foot buffer around an active bald eagle nest located just west of the Island parking lot. Indirect impacts due to the boardwalk coverage of wetland vegetation would result in a restriction of sunlight reaching the marsh floor. Constructing the boardwalk at an appropriate elevation to allow penetration of sunlight would minimize this impact.

Alternative B would also result in work performed over unvegetated, open waters (deepwater habitat). Pile-supported structures would be constructed for the hike/bike bridge crossing over the channel of Back River. Aerial coverage of waters associated with the bridge would be approximately 3,049 square feet. The three boat docks would also be located partially over open waters; however, the impact of these structures has been considered under vegetated wetland impacts (0.08 acres).

Temporary indirect impacts associated with Alternative B construction would include the damage to wetland vegetation and increased siltation of nearby waters resulting from the placement of mats and other construction equipment necessary to drive the pilings. These impacts would be minimized with the use of top-down construction.

Secondary impacts to wetlands resulting from Alternative B appear to be minimal. Other than the potential for litter to be deposited by visitors within the marsh as they utilize the hike/bike trails and

boardwalks, no other major impacts to the wetlands would be expected. With the addition of the interpretive boat tour and water taxi, secondary impacts to the marsh shoreline of Back River and Sandy Bay could occur as a result of increased boat wake. This impact was discussed under “Section 4.3.2.3, Surface Waters.”

Methods to mitigate indirect and secondary impacts to wetlands would include minimizing the width of the boardwalks and hike/bike trails crossing the area marshes to that dimension which is absolutely necessary and designing the floor elevation of these structures at a height to allow angled sunlight to reach the marsh beneath. The placement of litter within the wetlands by the visiting public could be minimized by frequent and strategically located waste disposal bins, as well as routine visitor monitoring/enforcement. Additionally, the potential harm to the marsh shoreline could be minimized by requiring interpretive boats to travel at specified, low speeds.

The wetland impacts that would result from Alternative B have also been reviewed relative to the 17 different wetlands studied for wetland functional values and summarized in Table 3-17 (“Chapter 3: Affected Environment”). This alternative would impact wetlands identified as A1, A2, 7, 12, and 14.

The boat docks would affect wetlands A2, 7, and 14. Wetlands A2 and 7 have steep banks with little vegetative structure, thus they received low scores for shoreline bank erosion control. Because these locations naturally lack shoreline protection measures and erosion is prevalent, the docks at Neck of Land and Powhatan Creek Overlook could be at risk to soil instability, and the construction design should take this into consideration. This does not appear to be an issue for the Jamestown Island dock at wetland 14, which does not have a shoreline “bank” where erosion is a potential problem. Each of these wetlands scored low in tidal fisheries habitat, primarily due to a lack of structure. The placement of the docks at these locations could serve to enhance this wetland function.

The majority of the indirect impacts would be proposed in wetlands A1 and 12. These two wetlands were found to provide some of the highest functional values in the project area for almost all categories studied. A1 (Neck of Land marsh) would be indirectly impacted by the bike/hike trail, and indirect wetland impacts would be proposed in wetland 12 for the relocated footbridge leading to the Observation Building. These structures would primarily affect the wildlife and tidal fisheries habitat functions within these wetlands. Sedimentation and water quality functions may temporarily be affected, but once the impact zones become revegetated, these functions would be restored.

Effects of Alternative C

Minor, indirect impacts to vegetated wetlands resulting from shading in Alternative C would approximate 0.28 acres due to the construction of pile-supported boardwalks and docks.

Pile-supported structures would comprise the only land use in the wetland areas under Alternative C. Three boat docks with pedestrian pathways leading to the docks and a boardwalk between the Island parking area and the Observation Building are planned. Docks would be located at Neck of Land, Powhatan Creek Overlook, and the Island parking area. No hike/bike trail crossing the Neck of Land marsh is proposed in Alternative C. In total, the pedestrian boardwalks and docks would have negligible, indirect impacts due to shading of vegetated wetlands.

Temporary, indirect impacts associated with Alternative C structures would include damage to wetland vegetation, the increased siltation of nearby waters resulting from the placement of mats and other construction equipment necessary to drive the pilings, and the primary loss of wetland habitat from the pilings. This would be minimized, however, by use of top-down construction techniques.

The potential for litter to be deposited by visitors within the marsh as they utilize the trails and boardwalks would be a secondary impact to wetlands. In addition, Alternative C calls for the use of boats to transport visitors from the various points of interest across the park. Secondary impacts to the shorelines of Back River, Powhatan Creek, and Sandy Bay could occur, causing further sedimentation and turbidity in the area's waters. The marsh shoreline of Back River and Sandy Bay could also see further erosion as a secondary impact of additional boat traffic.

Mitigation measures for indirect and secondary impacts to wetlands would be the same as in Alternative B and would include minimizing the width of the boardwalks and trails and designing their floor elevations to allow angled sunlight to reach the marsh. Littering by the public could be minimized by frequent and strategically located waste disposal bins, as well as routine visitor monitoring/enforcement. Limiting boating speeds to minimize wake could protect the marsh shoreline.

The wetland functional values potentially affected by the Alternative C improvements are limited to wetlands A2, 7, 12, and 14 (see Table 3-17). The boat docks would affect wetlands A2, 7, and 14, thus shoreline erosion control and fisheries functions (as described in Alternative B) would be affected. Likewise, the impacts to wetland functions for wetland 12 for the Pitch and Tar Swamp footbridge would be the same as Alternative B (wildlife and fisheries habitat).

Effects of Alternative D

Alternative D does not propose any improvements on Neck of Land or Glasshouse Point that would impact wetlands, nor does it propose any construction over open water. All indirect wetland impacts are associated with construction of the pedestrian footbridge to the Visitor Center/Observation Building at the Townsite.

For Alternative D, the existing Island parking area would not be changed. As a result, the existing walkways directing visitors to the existing boardwalk would remain in place. Therefore, the new boardwalk crossing Pitch and Tar Swamp would need to connect to the parking lot area at approximately the same location as the existing boardwalk. This would cause the new boardwalk structure to be angled more than the other alternatives, causing it to have a longer span across the wetland. This is expected to have a negligible impact to the Pitch and Tar marsh due to shading. Impacts would total 0.27 acres and would be indirect and negligible.

With no proposed boat docks and boardwalks across the marsh, Alternative D would have far less secondary impacts to wetlands than the other alternatives. Secondary impacts would be limited to those affecting Pitch and Tar Swamp as a result of the increase in visitor usage (noise, litter, etc.).

Wetland functions lost as a result Alternative D appear to be minimal because work in wetlands would be restricted to Pitch and Tar Swamp (wetland 12). The functions offered by this wetland include sediment stabilization, water quality, wildlife habitat, and fisheries habitat. The footbridge to the Observation Building would affect the wildlife and fisheries habitat values in the immediate vicinity due to impacts to vegetative structure from shading. As mentioned under Alternatives B and C, constructing the boardwalk at an appropriate height to allow for sunlight penetration would minimize shading impacts.

Effects of Alternative E

All indirect wetland and open water impacts would be the result of pile-supported hike/bike trails, docks, and a bridge, totaling 0.80 acres of coverage. This impact would be negligible.

The main difference between Alternative E and the other alternatives is the placement of a bike/hike boardwalk across the Neck of Land tidal marsh

leading to the Powhatan Creek Overlook. The boardwalk would have two widened areas to serve as overlooks and would be bridged across the Powhatan Creek channel to connect to the overlook. Indirect wetland impacts would include the shading of wetland vegetation by the wooden structure.

Another difference is that Alternative E would have only two boat docks – one would be located on the eastern side of Neck of Land and the other would be just north of the Island parking lot. Wooden, elevated footpaths would lead visitors to the boat docks, which would result in negligible impacts due to coverage of a very small portion of vegetated wetlands along the shorelines and open waters.

Alternative E would utilize the same configuration as Alternatives B and C for the footbridge between the Island parking area and the Observation Building, resulting in the indirect impact to the tidal marsh below (Pitch and Tar Swamp).

Temporary, indirect impacts resulting from Alternative E would include construction damage to vegetation and increased siltation due to the installation of the bridge and other pile-supported structures. Temporary damage would be avoided to the maximum extent with top-down construction. Secondary impacts would include littering by visitors and potential shoreline erosion caused by increased motorboat wake. Potential steps that could be employed to offset these impacts include minimizing the width of the boardwalk and road crossing to that which is absolutely necessary; constructing all boardwalks at an elevation to allow angled sunlight to reach the marsh floor; and the strategic and frequent placement of waste disposal bins to reduce littering.

Impacts to wetland functions and values for Alternative E are similar to Alternative B. Work proposed under Alternative E would affect two of the more highly valued wetlands in terms of functions, wetlands A1 and 12. The Neck of Land marsh (A1) is highly valued for tidal fisheries

habitat, shoreline stabilization, sediment stabilization, and water quality. The placement of the hike/bike trail across the marsh would affect the wildlife and fisheries habitat values the most. Once the trail is installed, the wetland should continue to offer sediment stabilization and water quality functions. As for wetland 12, the boardwalk to the Observation Building would affect wildlife and fisheries habitat as similarly described for the other alternatives.

Alternative E proposes wooden boat docks at wetlands A2 and 7, two wetlands that have weak shoreline protective measures. As described in Alternative B, these structures could add to the shoreline erosion problems if not designed and constructed properly.

Cumulative Impacts

Cumulative impacts to wetlands and deepwater habitats would result from adjacent land uses and development within the Powhatan Creek watershed. These impacts would include reduced wetland acreage and water quality. However, because the impacts to wetlands from the Jamestown Project are negligible under all alternatives, these impacts would not contribute to cumulative impacts to wetlands within the surrounding area.

Conclusion

Table 4-9 provides a summary of proposed wetland and open water impacts associated with each alternative.

As noted previously, all alternatives, including the No Action Alternative, would result in 0.03 acres of direct impact to a non-jurisdictional wetland. As for indirect impacts, Alternative D would have the least amount due to this alternative not having any trails crossing the Neck of Land marsh; nor does this alternative call for newly constructed boat docks that could potentially impact shoreline functions. Alternative D does require more wetland coverage for the Pitch and Tar Swamp footbridge due to its different starting point.

The alternative with the highest total indirect wetland/open water impacts would be Alternative B. This alternative has the longest total linear distance of boardwalk of all the alternatives.

Because the majority of impacts to wetlands would be indirect and direct impacts to non-jurisdictional wetlands would be minor, none of the alternatives would result in the impairment of wetland functions and values, an important natural resource.

4.3.2.6 Groundwater

Potential sources of groundwater impact vary by alternative, but specific quantification is difficult. As such, impacts to groundwater will not be analyzed separately for each action alternative, but instead will be discussed qualitatively under “Effects of Alternative A (No Action)” or “Impacts Common to the Action Alternatives.”

Effects of Alternative A (No Action)

APVA facilities would continue to draw a small amount of their water supply from groundwater wells. An old sanitary sewer line would run through

the marsh near the Visitor Center and would remain in danger of failing, and existing petroleum storage tanks would remain in place. Leaking tanks would not be identified or replaced, resulting in continuing threats to groundwater. In addition, stormwater runoff from impervious areas would remain unmitigated, as most of the facilities at Jamestown were built prior to regulations requiring this.

Impacts Common to the Action Alternatives

Well Water

The APVA’s facilities would no longer use the existing groundwater wells for potable water. The wells would remain in place to be used by the archaeological staff and for watering landscape plants. While construction activities are not likely to impact the wells, the location of the sewer facilities and existing underground storage tanks could impact groundwater, thereby impacting the wells. If the groundwater were to become contaminated, using the wells for cleaning or watering purposes would be undesirable.

Table 4-9: Summary of Impacts to Wetlands and Open Water (acres)

	Cowardin Classification	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Dock and Associated Decking (Indirect)	E2EM1R/ E1UB3R	—	0.08	0.08	—	0.03
Boardwalk (Indirect)	E1UB3R	—	—	—	—	0.03
	E2EM1R	—	0.53	—	—	0.48
Pedestrian Footbridge (Indirect)	E2EM1Rb	—	0.19	0.20	0.27	0.20
Open Water Bridge (Indirect)	E2EM1R/ E1UB3R	—	0.07	—	—	0.06
Jamestown Rediscovery™ Center Parking & Utilities (Direct)	E2EM1Rb	0.03	0.03	0.03	0.03	0.03

Sanitary Sewer

To accommodate future increases in need, the existing and failing sanitary forcemain in the marsh area near the Visitor Center would be capped at both ends, filled with flowable fill, and abandoned in place so as not to disturb wetland areas. A new forcemain would be constructed to ensure long-term reliability of the system. However, this new forcemain, along with approximately 600 feet of sanitary sewer pipe and three manholes constructed to service the maintenance area, could leak into soils and groundwater, resulting in contamination. Sewer systems should be monitored regularly to ensure the integrity of the system is maintained.

In Alternatives B, C, and E, new sewer lines at the new Visitor Center, the Intermodal Transportation Terminal at Neck of Land, and the Agricultural site would increase the threat of contamination to groundwater from sewage leaking. To minimize this risk, forcemains and connections should be checked regularly. Low impact restrooms with no-flush toilets are proposed for the Agricultural site under two of the action alternatives, which would help minimize the risk of leaking sewage pipes.

Stormwater

All alternatives propose construction that would result in an overall increase in impervious cover. To counter the increased runoff from these areas, stormwater collection and retention systems at Glasshouse Point for water quality protection would use a combination of perimeter swales and flexible pipe to direct filtered stormwater and trap suspended sediments. In addition, improvements to the Colonial Parkway would include swales to match the existing contours and minimize cut and fill along both sides of approximately 1000 feet of Parkway improvements. This would maximize the water quality efficiency of the roadside ditches while ensuring positive drainage; however, some local flooding of pathways and erosion could occasionally occur. A grassed drainage system throughout could direct runoff and reduce pollutants in runoff that would otherwise enter the groundwater system, and

an erosion and sediment control plan would be instituted during construction to capture suspended materials that might increase the turbidity of groundwater. Stacked hay bales, silt fences, slope fabric or mats, or sandbags could be used as part of this plan.

Storage Tanks

Underground storage tanks (USTs) would pose several sources of contamination to groundwater. If left in the ground, additional releases from leaking tanks would be a continuing source of groundwater contamination. However, if a UST is removed, the surrounding petroleum-contaminated soil could continue to infiltrate groundwater. Replacement of a UST with an aboveground storage tank (AST) would also have a potential impact to groundwater, as the tank contents could spill and leach into the soil; however, problems are easier to identify with ASTs. Shallow groundwater and permeable soils would increase this risk. Monitoring plans should be implemented to monitor product levels in both USTs and ASTs. This would give early notice if a tank were leaking.

Utility Lines

Utility lines would be removed and added throughout Jamestown Island in association with each of the alternatives. New and old utility lines could be pathways for migration of contamination and contaminated groundwater. Groundwater testing and monitoring would help to determine the severity of this potential problem.

Cumulative Impacts

Cumulative impacts to groundwater would result from increasing development within the surrounding area. As development increases, potential threats to groundwater contamination also increase. These threats would be similar to those identified above under "Impacts Common to the Action Alternatives." In addition, if potable water is obtained from wells instead of connections to public water, groundwater resources would be partially depleted.

Adequate erosion and sediment control plans, connections to public water and sewer, and long-term monitoring of groundwater resources within the area would help minimize cumulative impacts to groundwater resources.

Conclusion

There is no groundwater quality data for Jamestown Island, and potential sources to groundwater vary by alternative making specific quantification difficult. Based on a general assessment of possible changes to groundwater quality, none of the alternatives would result in impairment to groundwater resources. Implementing a long-term monitoring plan would help minimize impacts on groundwater quality.

4.3.2.7 Vegetation

The following sections describe the impacts of each of the action alternatives on the vegetative communities and exotic invasive species within the Jamestown Project site. Impacts to rare, threatened, and endangered species are discussed under “Section 4.3.2.9” of this chapter.

Methodology

Vegetative cover types were identified within the project site using the *Natural Communities of Virginia Classification of Ecological Community Types* (Fleming et al. 2001) and *Standardized National Vegetation Classification System* (Nature Conservancy 1994), as described within “Chapter 3: Affected Environment.” Vegetated natural communities comprise approximately 91% of the project area. Developed infrastructure, buildings, mowed yards/fields associated with park operations, and open-water ponds and tidal creeks make up the remainder. Seven cover types totaling 1,619 acres were identified based on orthophotos, 200-foot scale glossy color photographs, and field reconnaissance.

In analyzing the various alternatives, the degree of impact to a vegetative community should be in context to the frequency of occurrence in which the community type can be found (common or rare) and the type of proposed impact (direct or indirect). For

purposes of this analysis, the following terms and thresholds will be used to define the level of impact on vegetation:

Direct Impact: Work within a vegetative type that would eliminate the type due to man-made structures (i.e. building), or convert the vegetative type into another type (i.e. forested area converted to a field).

Indirect Impact: Work within a vegetative type would not require the complete conversion from one type to another but may result in temporary damage to vegetation due to construction or may restrict access for vegetation to acquire direct sunlight (i.e. pile supported structures).

Negligible: Work would cause indirect impacts only.

Minor: Work would cause the direct impact of less than 1% of the vegetative type.

Moderate: Work would cause the direct impact of between 1 and 10% of the vegetative type.

Major: Work would cause the direct impact of over 10% of the vegetative type.

The discussion below focuses on the comparison between the alternatives and the impacts (losses) to the natural vegetative community types using the defined limits specified above. Those man-altered land features (such as the interpretive areas and mowed yards) are excluded from consideration in the vegetation impact analysis.

Effects of Alternative A (No Action)

Under Alternative A, the No Action Alternative, infrastructure would remain the same and no new additional improvements to the property would be proposed. As a result, impacts to vegetative communities would not occur under this alternative and would therefore be negligible. Cover types and their relative areas would remain as they are currently (see Table 3-20).

Also, an invasive species implementation and monitoring plan would begin, in particular for control of Phragmites. Other invasive species would continue to spread until additional funding was obtained to prepare and implement appropriate control strategies.

Impacts Common to the Action Alternatives

Impacts due to removal and/or coverage of vegetative communities would occur for each of the action alternatives, but at varying levels. Proposed work common to all of the action alternatives includes construction of the Agricultural exhibit site on the Island, the installation of a water main and sewer line to the Jamestown Rediscovery™ Center, expansion of the Jamestown Rediscovery™ Center parking area, and the construction of a hike/bike trail between Glasshouse and Jamestown Settlement.

The work at the Agricultural exhibit site would result in a minor, direct impact to 0.34 acres of mesic mixed hardwood forest, as this would be converted permanently to open field habitat.

The installation of the utility lines to the Jamestown Rediscovery™ Center would begin at a connection point to existing utility lines at the Colonial Parkway entrance to the Jamestown Island parking lot. The installation is expected to traverse through the mesic mixed hardwood forest using a small backhoe with a ±1-foot wide bucket. Attempts would be made to install the utility lines through this forested section without having to remove overstory trees. Some minor disturbances would occur to the understory vegetation, but it is expected that the disturbed areas will revegetate quickly after installation is complete, resulting in short-term, minor impacts to vegetation. Once the utility lines reach the service road, temporary impacts to several shrubs along the road shoulders are expected at Pitch and Tar Swamp. Again, the disturbed area is expected to revegetate quickly, resulting in only short-term, minor impacts.

Also at the Jamestown Rediscovery™ Center, all action alternatives include expansion of the existing parking. This would result in 0.03 acres of direct impact to an isolated, non-jurisdictional wetland (tidal oligohaline marsh). This wetland is of minimal value and has possibly formed due to the sanitary drain field located below it. Once the APVA property is connected to public water and sewer, this drain field would be removed because it is located within 100 feet of Pitch and Tar Swamp, and therefore within the RPA. The act of removing the drain field would also directly impact the isolated, non-jurisdictional wetland.

The hike/bike trail between the Glasshouse parking area and Jamestown Settlement would potentially result in a direct loss of 4,302 square feet of upland mesic mixed hardwood forest.

For all action alternatives, spread of invasive species could potentially occur during construction activities in already disturbed areas as well as undisturbed, pristine areas. In order to limit the impact of invasive species, intensive monitoring during and after construction would occur. In addition, mats and top-down construction would be used within wetlands to limit the spread of Phragmites.

Effects of Alternative B

Upland Vegetation

Alternative B would include construction of an Intermodal Transportation Terminal, parking area, and hike/bike trail at Neck of Land that would result in a minor impact to upland mesic mixed hardwood forest and open fields. The hike/bike trail on Neck of Land, however, would utilize much of the old road trace that currently exists on the site. Use of this space would minimize the amount of disturbance to trees and ground vegetation between the proposed parking area and the marsh. In addition, approximately 0.55 acres of forested vegetation would be planted along the Colonial Parkway to minimize viewshed impacts.

Minor losses to upland vegetation on Jamestown Island would result from improvements to the Island parking lot and the parking area at the Jamestown Rediscovery™ Center.

Overall, 5.05 acres of upland mesic mixed hardwood forest would be directly impacted, 0.7% of the total cover of this vegetation type in the project area. The impact would therefore be minor. A total of 0.24 acres of open fields (0.8% of the total cover for this vegetation type) would also be impacted in Alternative B; therefore it would be a minor impact. An additional 1.63 acres of forested and herbaceous vegetation would be indirectly impacted by the proposed actions of Alternative B. These impacts would be temporary and related to construction activities; therefore, the impact would short-term and negligible.

Wetland Vegetation

Alternative B would have indirect impacts to tidal oligohaline wetland vegetation, primarily associated with boardwalks for the hike/bike trail crossing the Neck of Land marsh, the pedestrian footbridge to the Observation Building, and boat docks.

The majority of the 0.87 acres of indirect wetland vegetation impacts would occur as a result of coverage from the hike/bike boardwalk leading from Neck of Land to the Jamestown Island parking area. Similarly, the pedestrian footbridge between the parking area and Observation Building would be elevated on pilings. Impacts to vegetation during construction of these improvements are expected to be negligible and temporary. However, long-term, indirect impacts could occur resulting from shading caused by the boardwalks. Constructing the boardwalk and footbridge at an appropriate height to allow for sunlight penetration to the vegetation below would minimize this impact.

Effects of Alternative C

Upland Vegetation

Alternative C proposes additional parking, an Intermodal Transportation Terminal, and a short

pedestrian trail within the upland area at Neck of Land. These improvements would result in minor impacts to the mesic mixed hardwood forest community type and open fields. In addition, approximately 0.55 acres of forested vegetation would be planted along the Colonial Parkway to minimize viewshed impacts.

Additional minor losses of mesic mixed hardwood forest and open fields would occur at the Powhatan Creek Overlook boat dock. On the Island, mesic mixed hardwood forest would be lost to various improvements.

In total, trails, new buildings, and parking areas (both paved and unpaved) would directly impact 6.96 acres of mesic mixed hardwood forest and 0.22 acres of open fields. Indirect shading impacts would result from construction of elevated bridges, boardwalks, and docks. These would impact a total of 0.17 acres of mesic mixed hardwood forest. Temporary construction damage would accrue to an additional 1.75 acres of mesic mixed hardwood forest and 0.20 acres of open fields; however, these areas would revegetate following the completion of construction. Because these impacts affect relatively small percentages of the overall cover of the vegetation type, the impacts would be considered minor.

Wetland Vegetation

Alternative C would result in indirect shading impacts to tidal oligohaline marsh from coverage with open-pile structures, totaling 0.28 acres. This includes the construction of a pedestrian footbridge and boat docks. The impact would be negligible.

Effects of Alternative D

Alternative D represents the fewest impacts to existing vegetation within the project area, primarily because no major work is proposed at Neck of Land.

Upland Vegetation

Direct impacts to mesic mixed hardwood forest would occur from construction and reconfiguration of new buildings and paved and unpaved parking

areas. These impacts would be minor relative to the total area of the cover type and would total 0.39 acres. An additional 0.11 acres of mesic mixed hardwood forest would be indirectly impacted during construction. The impact would therefore be considered negligible.

Wetland Vegetation

Alternative D would include negligible impacts to wetland vegetation: approximately 0.27 acres of coverage from the pedestrian footbridge leading to the Observation Building. However, this impact would mostly occur during construction, and the long-term impact of the footbridge on the marsh would be indirect, due to shading. This impact would be negligible.

Effects of Alternative E

Upland Vegetation

Impacts to upland vegetation are similar to those in Alternative B. Construction of parking areas (paved and unpaved), new buildings, and trails would result in direct impacts to 4.33 acres of mesic mixed hardwood forest and 0.30 acres of open fields. These impacts would be minor when considered in the context of the total coverage of the respective vegetative cover types. In addition, approximately 0.55 acres of forested vegetation would be planted along the Colonial Parkway to minimize viewshed impacts.

Indirect impacts resulting from construction of boardwalks, docks, and a bridge would result in shading impacts to 0.18 acres of mesic mixed hardwood forest. An additional 0.80 acres of mesic mixed hardwood forest and 0.18 acres of open fields would be temporarily disturbed by construction; however, these areas would revegetate once construction was completed. Overall impact would be negligible.

Wetland Vegetation

Approximately 0.80 acres of tidal oligohaline marsh would be indirectly impacted in Alternative B. The bike/hike trail under Alternative E would exit the

uplands at Neck of Land in a westerly direction and traverse the adjacent tidal oligohaline marsh, subsequently crossing Powhatan Creek. This alternative proposes the inclusion of three expanded overlooks within the marsh as part of this trail. The impact to the marsh resulting from this structure would be negligible.

Additional negligible indirect impacts to wetland vegetation due to shading coverage would occur on the Island at the proposed pedestrian footbridge crossing Pitch and Tar Swamp.

Cumulative Impacts

Cumulative impacts to vegetation would result from increased development pressures within the surrounding area. This would result in further losses of forested and herbaceous upland and wetland vegetation. Loss of upland and wetland vegetation, in particular forested vegetation within the RPA, would result in loss of wildlife habitat and increases in diminished water quality. Depending on the amount of vegetation removed, this could potentially result in moderate to major cumulative impacts; however, the impacts to vegetation cover types related to the Jamestown Project actions would not contribute considerably to cumulative impacts. In addition, mitigative actions, including appropriate erosion and sediment control plans, best management practices, and revegetation after construction would help minimize cumulative impacts within the area.

Conclusion

Table 4-10 summarizes estimated impacts to the various vegetation covers types within the Jamestown Project area. Alternatives B, C, and E would incur minor, direct impacts to mesic mixed hardwood forest at Neck of Land with construction of a parking area and Intermodal Transportation Terminal facility. Although not directly offsetting direct impacts, approximately 0.55 acres of forested vegetation would be planted along the Colonial Parkway to minimize viewshed impacts to this resource.

Table 4-10: Summary of Impacts to Vegetation Cover Types (acres)

		Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Upland Vegetation	Mixed Mesic Hardwood Forest	—	5.05 1.45*	6.96 1.92*	0.39 0.11*	4.33 0.98*
	Open Fields	—	0.24 0.18*	0.22 0.20*	—	0.30 0.18*
Wetland Vegetation	Tidal Oligohaline Marsh	—	0.03 0.87*	0.03 0.28*	0.03 0.27*	0.03 0.80*
Developed Park and Interpretive Areas		—	1.04 0.49*	0.84 0.40*	0.71 0.38*	0.88 0.41*

* Indirect impacts

Overall, Alternative D would have the least impact to vegetative communities because it does not include any construction at Neck of Land.

None of the alternatives would result in moderate or major impacts to vegetative communities; therefore, they would not result in impairment of the upland and wetland vegetation communities. These communities would continue to provide ecological value to the local area and be an important natural resource.

4.3.2.8 Wildlife

Impacts to wildlife populations were evaluated based upon effects on the various habitat community types. Specific data on small mammal populations for the area will not be available until 2003 so these impacts were generally assessed. The degree that the alternatives would impact wildlife/fisheries population numbers cannot be quantified. Yet, habitat impacts can be evaluated and would vary with the different alternatives. Some of the proposed work that would serve to improve existing infrastructure, such as the reconfiguring of the existing parking area, would not cause impacts beyond that which have already occurred.

Impacts to wildlife habitats correspond closely to the impacts described in the vegetation section. The following discussion relates the impacts in terms of the effects to common, non-listed wildlife species that utilize the project area. Impacts to rare, threatened, and endangered species are described in “Section 4.3.2.9” of this document. Impact definitions and thresholds used to describe wildlife habitat impacts will be the same as those used in the vegetation section. Secondary impacts will be discussed in terms of those activities that potentially could occur once a structure is in place, such as noise, disturbance, increased wave action, etc.

Effects of Alternative A (No Action Alternative)

Alternative A does not require the construction of any additional improvements. Therefore, direct and indirect impacts to wildlife habitat beyond what currently exists would not occur. Secondary impacts related to disturbance could occur due to expected increases in visitor usage. However, the species of wildlife inhabiting those portions of land that would be exposed to the increase in visitor numbers are those already associated with park-like environments, man-made structures, and human activities, such as the gray squirrel, northern cardinal, American robin, house wren, American crow, northern mockingbird, and other common residents.

Impacts Common to the Action Alternatives

Actions shared by all of the action alternatives would include the work proposed within the Townsite for interpretive venues. Alternative B, however, also proposes the expansion of the Jamestown Rediscovery™ Center for storing artifacts. This improvement is small in scale and would have negligible impacts to fish and wildlife.

Similarly, impacts to wildlife habitat due to the installation of new utility lines to the Jamestown Rediscovery™ Center would be minimal and short-term. Minor disturbances to understory vegetation required to make room for the equipment would occur, but these disturbances would be temporary. Once the installation is completed, natural vegetation of the same composition would return, and the habitat would be restored.

Because all of the alternatives, including the No Action Alternative, would have increases in visitation, secondary impacts to wildlife as a result of human disturbances would be similar within the Townsite region. The presence of people on other portions of the property, however, would vary by alternative because the major differences primarily involve transportation (or the distribution) of visitors throughout the property. Visitation would increase across the entire site, including the Loop Drive on the east side of the Island. Increased disturbance to wildlife could also expand beyond the Townsite.

Secondary and indirect impacts to fisheries habitat would also occur from increases in impervious cover and loss of forested habitat. Stormwater runoff and siltation would affect water quality and adversely affect fisheries habitat. Erosion and sediment control plans and use of best management practices would help minimize this impact.

Effects of Alternative B

Minor and negligible impacts to a variety of fish and wildlife habitats would occur with implementation of Alternative B. The proposed parking area, Intermodal Transportation Terminal, and hike/bike

trail would cause the direct, but minor, loss of upland, mixed pine/hardwood forest (mesic mixed hardwood deciduous forest) at Neck of Land. This habitat type is used by a number of non-migratory animals common to eastern Virginia, such as the gray squirrel, raccoon, white-tailed deer, wild turkey, Carolina wren, woodpeckers, and eastern box turtle. The loss of trees to development would also reduce the availability of habitat for migratory bird species such as warblers, vireos, and finches.

In order to mitigate the loss of forested vegetation and habitat for migratory birds and other species, the NPS would reforest and/or convert selected fields within the area to warm season grasses and shrub habitat, as outlined in the Center for Conservation Biology's (CCB) *Field Biodiversity Plan for Colonial NHP* (CCB 2002). In addition, approximately 0.55 acres of forested vegetation would be added on the northern side of Neck of Land, along the Colonial Parkway.

Wetland-dependent species would be affected by the placement of the hike/bike trail through the Neck of Land marsh leading to the Jamestown Island parking area. Effects of this action would cause indirect impacts to tidal oligohaline marsh habitat. Use of this boardwalk would also result in secondary human disturbance impacts to such species as rails, marsh wrens, sparrows, and small mammals. No open water would be affected until the bike trail reaches the vegetated shoreline of Back River. Therefore, impacts to waterfowl, shorebirds, wading birds, and other species preferring tidal creeks and open water for habitat would not be affected on Neck of Land. Indirect impacts to these species are expected to occur due to the human disturbance expected where the hike/bike trail bridge spans over Back River.

The new footbridge crossing Pitch and Tar Swamp would also indirectly affect wetland wildlife. However, the removal of the old footbridge leading to the existing Visitor Center would serve to offset the impacts caused by the new footbridge.

Alternative B proposes the construction of three new boat docks on the edge of Powhatan Creek and Back River. This action would initially result in a temporary impact to fisheries habitat, particularly during construction when siltation would be most prevalent. Noise during construction could also contribute to secondary impacts to fisheries as well as wildlife. Once construction is completed, however, the docks would provide additional structural habitat for fish in locations where shoreline structure is presently absent. The dock at Powhatan Creek Overlook would also be designed and constructed to protect the highly eroded shoreline from further erosion. Overall, no direct losses in fisheries habitat would be expected from the docks.

For water-dependent wildlife, the boat docks would utilize shoreline habitat for wading birds; perching habitat for water-dependent birds, such as kingfishers; and riparian habitat for mammals, such as raccoons and minks.

Operation of the boat tour/transport would also contribute to indirect impacts to fisheries and wildlife from air, noise, and water pollution. Secondary impacts would include noise disturbance caused by the boats to such species as wading birds and waterfowl, and the additional air and water pollution caused by the gasoline-or electric-powered engines. No documentation from the FWS or the VDGIF as part of their fisheries surveys has indicated that the current level of boating activity in this region of the James River has degraded the ability of fish and wildlife populations to survive. Therefore, the increased use of boats is not expected to degrade the survivorship of fish or water-dependent wildlife populations. Additionally, boats using these docks would be moored and landed at Jamestown Marina, just upstream on Powhatan Creek. This would help limit impacts to water quality from fuel and oil spills or boat maintenance.

In addition, the values of fish and wildlife to society are numerous, one of which is their aesthetic beauty to observe. Alternative B's boating plan and

hike/bike trail would enhance the public's perspective of the local wildlife populations by providing access to observe animals in their natural habitat while they sojourn between Neck of Land and the Island.

To further limit impacts on fish and wildlife, the NPS would monitor the effects of boat traffic, visitor use, and construction on water quality, fisheries, and wildlife.

Effects of Alternative C

Impacts to fish and wildlife populations from Alternative C would not be as great as those resulting from Alternative B, primarily due to the lack of a hike/bike trail across the tidal marsh. The parking area and Intermodal Transportation Terminal on Neck of Land would have minor impacts to upland forested habitat, as described in Alternative B. The use of the uplands on Neck of Land would displace common wildlife such as gray squirrels, flying squirrels, white-tailed deer, raccoons, and various songbirds and woodpeckers. Mitigating measures would be the same as proposed under Alternative B.

Alternative C also calls for the placement of the footbridge crossing Pitch and Tar Swamp, similar to Alternative B and resulting in the negligible impact of riparian and wetland habitat in Pitch and Tar Swamp.

Alternative C also proposes the construction of three boat docks, as in Alternative B; therefore, the impacts to fish and wildlife would be the same as described for Alternative B.

Effects of Alternative D

Other than the No Action Alternative, Alternative D would have the fewest impacts to fish and wildlife habitat. A new footbridge would span Pitch and Tar Swamp between the parking area and the Observation Building. This structure would result in indirect impacts to riparian and tidal marsh habitat. However, this would be offset by the restoration of wetlands once the old footbridge has been removed.

Secondary impacts to wildlife populations under this alternative would be the highest at the Townsite where the improvements would be installed to accommodate increased visitation. Increased visitation would add to the level of human disturbance to the wildlife populations that reside and migrate through Jamestown Island.

There would be no impacts to fisheries populations because no docks or other work is proposed within the channels of Powhatan Creek, the Back River, or James River.

Effects of Alternative E

Alternative E would contain a variety of direct and indirect impacts to upland and wetland habitats, similar to those proposed under Alternative B. Improvements on Neck of Land would include a parking lot and Intermodal Transportation Terminal with hike/bike trails causing minor impacts to the upland pine/hardwood forest. Alternative E would place the hike/bike trail through an undisturbed portion of the Neck of Land uplands resulting in the potential removal of trees and ground vegetation for its construction. The bike/hike trail boardwalk would then span the Neck of Land marsh and open water habitat leading to Powhatan Creek Overlook. Habitat for waterfowl, wading birds, rails, and several marsh-loving songbird species would be affected, and the use of the hike/bike trail by visitors would also cause secondary impacts due to disturbances to animals in the immediate vicinity.

The new footbridge crossing Pitch and Tar Swamp would negligibly affect wetland and riparian habitat affecting waterfowl, wading birds, songbirds, and several species of reptiles and amphibians. This impact would be offset by the removal of the existing footbridge between the parking area and the Visitor Center.

Alternative E also calls for two boat docks to be constructed on the wetland edge and open water of the Back River on Jamestown Island and Neck of Land. The southern Back River boat dock would be

placed farther east than Alternatives B and C, but this would not add to fish/wildlife impacts beyond those proposed in the other alternatives. Habitat impacts from the boat dock on Neck of Land would be the same as in Alternatives B and C.

The single boat route for Alternative E is between the eastern side of Neck of Land southward and the Jamestown Island parking lot. Interpretive/transport boats are planned for use during the peak season. No additional boat traffic is proposed on Powhatan Creek other than to moor the boat at the Jamestown Marina, north of the Colonial Parkway. For this reason, secondary impacts to fish and wildlife populations caused by disturbances would be restricted to a smaller area than in Alternatives B and C.

Cumulative Impacts

Cumulative impacts to fish and wildlife habitat would be similar to those discussed under the "Vegetation" section: The majority of impacts would result from increased development pressures within the surrounding area. This would result in further losses of forested and herbaceous upland and wetland vegetation. Loss of upland and wetland vegetation, in particular forested vegetation within the RPA, would result in loss of wildlife habitat and increases in diminished water quality. Depending on the amount of vegetation removed, this could potentially result in moderate to major cumulative impacts; however, the impacts to fish and wildlife related to the Jamestown Project actions would not contribute considerably to cumulative impacts. In addition, mitigative actions, including appropriate erosion and sediment control plans, best management practices, and revegetation after construction would help minimize cumulative impacts within the area.

Conclusion

In summary, each of the action alternatives would require the minor loss of or indirect impact to various wildlife habitats for structural improvements. Fisheries and wildlife populations have been recently sampled, and it appears that

populations are stable and thriving. Structural improvements resulting from each of the alternatives would require a very small percentage of removal, considering the overall habitats available. Therefore, none of the alternatives appear to present a serious threat to any one species or group of species that utilizes the project area.

Because none of the alternatives would result major impacts to fisheries or wildlife habitat, the alternatives would not result in impairment of fish or wildlife or their habitat, as previously discussed.

4.3.2.9 Rare, Threatened, and Endangered Species

The Virginia Department of Conservation and Recreation, Division of Natural Heritage (VDNH) performed a survey to determine the presence of any listed species within the study area (Chazal and Van Alstine 2001). Only two listed species were found: the bald eagle and sensitive joint-vetch. This section analyzes the impacts to the federally-listed species. In addition, a general assessment of impacts to VDNH Conservation Sites within the Jamestown Project area is provided at the end of this section.

Within Chapter 5, the “Consultations with Agencies Related to Threatened and Endangered Species” section provides a brief summary of the consultation and coordination with regulatory agencies as well as local and regional NPS staff. Due to the presence of the bald eagle and the sensitive joint-vetch within the Jamestown Project area, their input helped planning team members make the most well informed decisions related to alternative design.

The draft Biological Assessment prepared by the Virginia Department of Conservation and Recreation, Division of Natural Heritage (2002) was used to assess the potential impacts to both the bald eagle and the sensitive joint-vetch. The finalized Biological Assessment was submitted to the FWS in October 2002 to initiate formal consultation under Section 7 of the Endangered Species Act. The signed Biological Opinion (as prepared by the FWS) will be appended to the ROD. Additional mitigative

measures identified by the FWS will be included in the ROD and implemented by both the APVA and NPS, per the requirements of Section 7 coordination.

Sensitive Joint-Vetch

Methodology

The effects of the alternatives on the sensitive joint-vetch population have been analyzed in terms of individual actions as well as the overall alternative. Criteria have been established to define the various levels of impact. These impact definitions will help to qualify the level of impact and will assist in the comparison of alternatives.

Negligible: An action that would affect very few individuals within the population, or affect the existing physical environment (habitat) within the Jamestown Project study area. The change would be so small or localized that it would have no measurable or perceptible consequence to the populations.

Minor: An action that would affect a relatively small number of individuals within the population, or affect the existing physical environment within the Jamestown Project area. The change would require considerable scientific effort to measure, is limited to relatively few individuals of the population, is very localized in area, and has barely perceptible consequences to the population.

Moderate: An action that would cause measurable effects on: (1) a relatively moderate number of individuals within the population, (2) a relatively large habitat area or important habitat attributes, or (3) a large area of the natural physical environment within the Jamestown Project area.

Major: An action that would have drastic consequences for population numbers, habitat area or important habitat attributes, or the existing physical environment within the study area. The population, habitat, or natural system function would be permanently altered from normal levels

under existing conditions, and the sensitive joint-vetch would likely be extirpated within the Jamestown Project area.

Effects of Alternative A (No Action)

Alternative A presents no new adverse impacts to the sensitive joint-vetch population. Existing threats include: wave action associated with severe storms; native and invasive species competition, in particular with common reed (*Phragmites australis*); herbivory; channel migration; sea-level rise; sedimentation; boating activities within the Back River; shoreline stabilization and structural development; and changes in water quality due to boating within the area and increased development within the watershed.

Effects of Alternative B

Alternative B proposes a new Intermodal Transportation Terminal with associated parking at Neck of Land. The facility could impact the sensitive joint-vetch population and its habitat by contributing to soil erosion and run-off from the upland areas. Run-off from parking lots may contain toxic chemicals that can reduce water quality within the marsh. To minimize this impact, all design and construction methods at the Neck of Land area (and for the entire Jamestown Project site as well) would incorporate best management practices to control soil erosion, run-off, and pollution.

Another proposed action associated with Alternative B includes the hike/bike trail and bridge connecting Neck of Land with Jamestown Island. The proposed alignment of the trail follows the old road trace, staying on existing asphalt, until reaching the tree line/marsh interface, where it then traverses through the marsh on an elevated boardwalk, staying at least 100 feet from the old road trace and the location of the last observed population of sensitive joint-vetch. This route avoids the most likely habitat for the sensitive joint-vetch (adjacent to the old road bed), thus minimizing the potential for impacts. The path of the marsh

boardwalk is also affected by the location of the most recent bald eagle nest (see below).

The primary threat to the sensitive joint-vetch population and its habitat resulting from construction of the marsh boardwalk is establishment of new stands of common reed. This plant rapidly out competes sensitive joint-vetch, which would be detrimental. To minimize this threat, top-down construction methods would be used. In addition, an invasive species management plan would be implemented. Currently, the NPS has a monitoring and implementation plan established for common reed. Initiating this plan prior to construction would help limit the threat that common reed poses.

Because the proposed trail alignment would avoid the prime habitat for the sensitive joint-vetch, impacts related to shading (die-back) would be avoided; however, impacts to the surrounding marsh are just as important and the boardwalk height would be designed appropriately.

Alternative B proposes the construction of three new boat docks to accommodate the proposed interpretive boat tour/water taxi within Back River. Construction of the new docks could impact the vetch and its habitat by contributing to a decline in water quality. To limit this impact, dock construction methods would follow best management practices and use materials that minimize toxic chemical leaching. As the Jamestown Project goes to design, planning team members would consult with the Virginia Institute of Marine Science for recommendations.

In addition, the boats would contribute to an increase in boat traffic within Back River. This could result in decreased water quality and increased wave action associated with boat wakes. However, the sensitive joint-vetch population was last observed at an interior location within the Neck of Land marsh, which may protect it from the adverse effects of boat wakes. Part of the proposed

mitigation for impacts to the sensitive joint-vech would include further research on the potential effects of increased boating activity on the marsh and sensitive joint-vech. To further limit the impacts associated with boat activity, the type of boat used would either be electric powered or an environmentally-friendly gas engine (2 vs. 4 stroke motors). Also, further mitigation for impacts to the sensitive joint-vech would include proposing no-wake zones within Back River (where the docks would be located and the tour/taxi would take place). With mitigative measures in place, impacts to the sensitive joint-vech population would be minor.

Effects of Alternative C

Proposed actions under Alternative C that would potentially impact the sensitive joint-vech include a new, large parking lot, Visitor Center, and collection facility in the uplands adjacent to the Neck of Land marsh. Unlike Alternative B, this new construction is larger and could potentially result in increased stormwater run-off, soil erosion, and decreased water quality. The use of best management practices would help limit the impact of these new facilities on the Neck of Land marsh, and thus on the sensitive joint-vech population.

Additionally, Alternative C includes three new boat docks to accommodate the new interpretive boat tour and transport, as described under Alternative B. Impacts related to this service would be the same as listed under Alternative B. With mitigative measures in place, impacts to the sensitive joint-vech population would be minor.

Effects of Alternative D

Alternative D does not include the addition of interpretive bike/hike trails through Neck of Land marsh or the boat tour within the Sandy Bay/Back River area. Therefore, Alternative D presents no new adverse impacts to the sensitive joint-vech population. Existing threats are described above under Alternative A. Overall impacts would be negligible.

Effects of Alternative E

Similar to Alternative B, Alternative E proposes new parking and an Intermodal Transportation Terminal at the uplands adjacent to the Neck of Land marsh. Impacts related to these facilities would be similar to those discussed under Alternative B.

Additionally, Alternative E proposes the construction of a hike/bike trail connecting Neck of Land with Glasshouse Point at the Powhatan Creek Overlook. This trail alignment would be on the western side of the Neck of Land marsh, away from the prime habitat of the sensitive joint vech. Impact to the marsh would include a potential decrease in water quality.

Alternative E also proposes the addition of two boat docks within Back River and the associated water taxi/boat tour. Impacts would be similar to those presented under Alternative B. With mitigative measures in place, impacts to the sensitive joint-vech population would be minor.

Bald Eagle

The bald eagle population has made a wonderful comeback in North America since the days of DDT toxicity, particularly in the Chesapeake Bay area. Data obtained from the William and Mary Center for Conservation Biology show that the number of nesting bald eagles in Virginia has increased 906% since 1977, from 31 to 312 nesting pairs. In 2001, the majority of Virginia's nesting eagles were associated with the Chesapeake Bay and the bay's tributary rivers (Potomac, Rappahannock, York, and James). The success of the eagles' population expansion since the early 1970s has prompted the FWS to propose de-listing of the species.

The James has been one of the more productive rivers in terms of the number of active nests (71 nests) and fecundity rates (average of 1.62 chicks per active nest compared to an average of 1.51 chicks per nest). As part of the James River habitat corridor, the Jamestown Island project area provides acres of relatively undisturbed, high quality habitat for nesting eagles. The CCB performs a yearly survey

for eagle nests and located three active nests on the Island. One nest (VAJC-0101) is located on the north shore of the Island just northwest of the existing Island parking area by approximately 600 to 700 feet. The other nests are located at the southeastern and northeastern ends of the Island, far removed from proposed work. Therefore, nest VAJC-0101 will be the focus of the discussion in this section regarding the alternatives analysis.

Methodology

An assessment of the effects resulting from the alternatives has been analyzed in terms of the impacts to the eagle population in Virginia. In order to better assess the alternatives on the bald eagle population, criteria have been established to define the various levels of impact. These impact definitions will help to qualify the level of impact and will assist in the comparison of alternatives.

Negligible: An action that would affect very few individuals within the Chesapeake/James River eagle population, or affect the existing physical environment (habitat) within the Jamestown Project study area. The change would be so small or localized that it would have no measurable or perceptible consequence to the populations.

Minor: An action that would affect a relatively small number of individuals within the Chesapeake/James River eagle population, or affect the existing physical environment within the Jamestown Project study area. The change would require considerable scientific effort to measure, is limited to relatively few individuals of the Chesapeake/James River eagle population, is very localized in area, and has barely perceptible consequences to the population.

Moderate: An action that would cause measurable effects on: (1) a relatively moderate number of individuals within the Chesapeake/James River eagle population, (2) a relatively large habitat area or important habitat attributes, or (3) a large area of the natural physical environment within the Jamestown Project study area.

Major: An action that would have drastic consequences for eagle population numbers, habitat area or important habitat attributes, or the existing physical environment within the study area. The eagle population, habitat, or natural system function would be permanently altered from normal levels under existing conditions, and the eagles would likely be extirpated within the Jamestown Island area.

Nest VAJC-0101 is a newly constructed nest, having first been discovered in 2000-2001. The uniqueness of this pair of eagles is their apparent comfort with the level of human activity, which occurs in the park around the nest site. Nevertheless, considerable effort has been given to protect the habitat resources for the bald eagle in the Jamestown study area. The APVA and NPS have met on numerous occasions with the FWS and the CCB to discuss the status of the bald eagle population, and more specifically, nest site VAJC-0101. On April 11, 2001, the FWS issued a Biological Opinion (BO) for the current NPS operations at Jamestown Island for the nesting bald eagles (located in Appendix F). Due to the fact that much of the park's infrastructure lies within the 1,320-foot protective zone of the nest, it is their opinion that the existing operations would result in the incidental taking of bald eagles by harassment at a level less than nest abandonment, and further action pursuant to Section 9 of the Endangered Species Act would not be taken if the NPS complies with the terms and conditions specified below:

- Picnics, parties, fireworks, or other loud sounds (other than traffic) are prohibited within 750 feet of the nest during the breeding season (December 15 to July 15).
- NPS must patrol the area routinely during the breeding season to ensure that visitors are not harassing the eagles by making loud noises or walking any closer to the nest than the edge of the parking lot or the edge of the road. All NPS employees should be briefed so that they can correct visitors on the spot if they see visitors harassing the eagles.

- Boats are not allowed to land on NPS property within 1,320 feet of the nest during the breeding season.
- Timber must not be cut within 750 feet of the nest during the breeding season (except for safety reasons).
- A vegetative screen was to be planted to prevent line of sight between the nest and the parking lot. Plants should be evergreens with the objective to prevent a view of the parking lot from the nest even in the winter. This work has been completed by the NPS.
- Maintenance work must be performed outside of the breeding season as much as possible.
- Monitor the nest weekly from November 15 to July 15.
- Care must be taken in handling any dead individuals to preserve the biological material in the best possible state, and to notify the FWS when finding dead individuals.

Insomuch as the FWS has issued this BO of harassment under existing operations, it is clear that all alternatives, at a minimum, would result in a similar opinion. None of the action alternatives, however, would result in moderate or major impacts to the eagles. All impacts are identified as either negligible or minor. A discussion about the expected impacts to the nesting pair of eagles is presented below for each alternative.

Effects of Alternative A (No Action)

Alternative A would not result in the addition of physical land improvements, but an increase in visitor usage is expected as 2007 approaches. Impacts associated with this alternative have been outlined in the FWS Biological Opinion (located in Appendix F) in which the above listed conditions must be implemented. Impacts are associated entirely with human disturbances to the eagles due to boat traffic and loud noises around the parking lot.

Impacts Common to the Action Alternatives

In addition to the increase in visitation and thus visitor disturbance, each of the action alternatives, as well as the No Action Alternative, call for the installation of new utilities to the Jamestown Rediscovery™ Center beginning at the Colonial Parkway approximately 480 feet south from nest VAJC-0101 and traversing through the forested section south of the Parkway until reaching the service road that crosses Pitch and Tar Swamp. The installation of the utilities will be performed using a small backhoe, and work is expected to cause an increase in the level of noise and disturbance within the protective zone of the nest site. No physical impacts to the habitat affecting the bald eagles would be expected. Nevertheless, if this work is done outside of the nesting season in accordance with the FWS Biological Opinion, no further protective measures are required, and no impacts to the eagles would occur.

Also at the Jamestown Rediscovery™ Center, all alternatives would expand the adjacent parking lot and remove a sanitary drain field within the RPA. This action would be within the 1,320-foot protective radius of nest VAJC-0101. Impacts from this action would be minimal, due to the protective evergreen screening between the nest and the construction area (both surrounding the nest and within Pitch and Tar Swamp) and the distance (approximately 1,000 feet from the nest). Initial consultation with FWS indicates that this activity could continue without time-of-year restrictions on construction.

Another common action among the alternatives includes the relocation of the pedestrian footbridge that crosses Pitch and Tar Swamp, connecting the Island parking lot with the historic Townsite and improving the visitor experience by providing expansive views of the Townsite. The improvements are outside of the 750-foot primary zone, and appear to be beyond the eagles' visibility due to the distance and dense vegetation. As a result, work in this region would have a negligible, if any, effect on the eagles' ability to raise young.

Effects of Alternative B

Alternative B would present minor impacts to the nesting bald eagle pair. These impacts are comprised of the following improvements within the 1,320-foot radius protective zone: approximately 1,800 linear feet of pedestrian/bike trail, a boat dock, reconfiguration of the existing Island parking, construction of a replacement Visitor Center at the parking lot, and expansion of the Jamestown Rediscovery™ Center.

As proposed, the pedestrian/bike trail would utilize the existing old roadbed on the Neck of Land uplands heading southward until it reaches the marsh. At this point, the hike/bike trail would become boardwalk across the Neck of Land marsh and head toward the southeast in a manner to avoid close proximity to the nest site. The trail would curve back towards the south, crossing Back River, and then connecting to the Island just north of the parking area and adjacent to the proposed south Back River boat dock. The trail would remain outside of the bald eagle primary protective zone (750-foot radius), but approximately 1,800 linear feet of boardwalk would be within the secondary protective zone of 1,320 feet. The nesting eagles are expected to initially incur noise disturbance from construction equipment during installation of the boardwalk unless work is proposed outside of the breeding/nesting season. Eventually, the hike/bike trail and boardwalk would route visitors to within 1,000 feet of the nest site and within view of the nesting eagles (i.e. no vegetative buffer), particularly at the bridging of Back River, which would elevate the boardwalk above the marsh level to allow for the passage of boats underneath. This work has the potential of introducing a higher level of disturbance to the nesting eagles compared to the existing conditions. This disturbance cannot be quantified; however, impacts may cause disturbance to feeding and roosting behavior along Back River above those mentioned in the FWS Biological Opinion written for existing operations.

The other improvements proposed within the 1,320-foot radius circle include work in the Island parking lot, the construction of the replacement Visitor Center, and the south Back River boat dock. The reconfiguration of the parking lot and the construction of the Visitor Center would initially cause significant noise levels, which would disturb the eagles if work were proposed during the nesting season. Otherwise, these improvements would cause alterations to the eagles' surroundings, which could have some affect on their behavior, but it appears the likelihood of impacts to the eagles would be negligible since the eagles have already shown a habituation to human activities around the parking area. The NPS has planted trees between the existing parking lot and the nest site to provide for a vegetative buffer as required in the FWS Biological Opinion. This step would assist in mitigating the impacts to any proposed work in the parking lot area.

The NPS proposes an interpretive boating experience for visitors as an alternative means of transportation to and from Neck of Land, the Glasshouse Point, and the Island. As proposed, boats would pass within approximately 450 feet of the nest site on Back River at approximately 30-minute intervals during operation hours (potentially 10 am to 5 pm). A recent NPS survey of existing boat traffic on Back River found that the eagles generally had no reaction to boats. The level of boating would not be substantially higher than current levels and would not likely add to the potential for disturbance to the natural behavior patterns of the eagles, particularly perching and feeding. Additionally, the proposed boat dock on the Island is outside the 750-foot primary protective zone of the eagle nest but within the 1,320-foot secondary protective zone. At times, it would be expected that visitors would be stationed at the dock waiting for boats to arrive for pick up. The proposed dock would be within the line of sight of the nesting eagles, and the expected noise of the visitors and boats could disturb the eagles.

Long-term impacts associated with Alternative B include the loss of nesting/roosting habitat adjacent to the riparian area of Neck of Land with the construction of the bike trail and parking improvements. Neck of Land offers mature pines suitable for nest sites, which would be removed for the project improvements. To minimize this impact, vegetation within the 100-foot RPA would not be removed or impacted. Also, the disturbance due to the use of the bike trail paralleling the shoreline could potentially cause other eagle pairs to avoid this area for nesting.

Effects of Alternative C

Alternative C incorporates the same boating and dock plan as Alternative B. Impacts to the nesting bald eagles as a result of these features would be the same as discussed for Alternative B.

Alternative C also proposes revisions to the Island parking lot and the construction of a ticketing facility within this lot. These revisions, in the short term, would cause construction noise to the nesting eagles. In the long term, the increased number of visitors congregating around the ticketing facility could contribute to disturbances intolerable to the eagles. The NPS has planted evergreen trees between the existing parking lot and the nest site to provide for a vegetative buffer as required in the FWS Biological Opinion. This step would assist in mitigating the impacts of any proposed work in the parking lot area. Work south of Pitch and Tar Swamp would be far enough removed from the eagle nest such that disturbances would be minimal, if any. This area is highly screened by trees and other vegetation, serving to block the view by the eagles and absorb any potentially loud noises.

Neck of Land offers a plentiful selection of old pine trees, and the proximity to open-water habitats makes it suitable as future eagle nesting habitat. Impacts to upland habitats on Neck of Land from Alternative C would be the greatest compared to other alternatives. A large portion of Neck of Land uplands would be utilized for parking and buildings, requiring the removal of potential pine

nest trees. Additionally, the hike/bike trail and parking areas near the upland/wetland boundary could potentially cause a disturbance to any eagles that may use the shoreline for roosting/perching.

Effects of Alternative D

Alternative D offers the least amount of impacts to the nesting bald eagles compared to all other action alternatives. It does not incorporate the use of boats and bike trails to transport park visitors to the Island. All visitors would arrive at the parking area similar to Alternative A (No Action Alternative). All impacts related to Alternative D have been described under "Impacts Common the Action Alternatives. As a result, the recommendations specified in the FWS Biological Opinion should serve to minimize impacts under Alternative D.

Effects of Alternative E

Alternative E would introduce many improvements within the 1,320-foot protective zone on the Island, but not as impacting to the nesting eagles as Alternative B. Improvements within the Island parking lot, including the construction of the replacement Visitor Center, would cause temporary disturbances during construction, although no additional habitat loss would occur. The NPS has planted trees between the existing parking lot and the nest site to provide for a vegetative buffer as required in the FWS Biological Opinion. This step would assist in mitigating the impacts to any proposed work in the Island parking lot area.

Alternative E also proposes a boating and dock plan. This plan differs significantly from the other alternatives; all boating activity would remain outside of the 1,320-foot radius within the Back River; the only two docks would be the Southern Back River and the Northern Back River boat docks. A boat dock is not proposed at Powhatan Creek for this alternative.

The stretch of river along the single proposed boating route contains only 500 to 600 linear feet of shoreline covered by trees. The remaining shoreline is open

marsh. The fact that most of the route does not contain shoreline trees would also help to minimize disturbance to perching/roosting eagles in this area. The repeated schedule of visitor pick-up and delivery by boat, however, would cause disturbances to this stretch of Back River further restricting the eagles' ability to hunt for fish in this area.

Like Alternative B, Alternative E proposes impacts to upland habitats on Neck of Land that could be used for nesting and perching/roosting by eagles. These impacts are associated with the new parking facility and Intermodal Transportation Terminal. The hike/bike trail as proposed would add to these impacts by winding through the uplands towards the west to the marsh line. Once in the marsh, the hike/bike boardwalk would introduce humans within full exposure of eagles utilizing the area. The availability of foraging area within the immediate vicinity of Powhatan Creek Overlook would be decreased.

VDNH Conservation Sites

Conservation sites represent key areas of the landscape worthy of protection and stewardship action because of the natural heritage resources and habitat they support. The VDNH has designated two conservation sites within or adjacent to the Jamestown Project area: Jamestown Island and Mill Creek Marsh.

The Jamestown Island conservation site is approximately 2,189 acres and includes tidal communities north of Back River (such as Neck of Land marsh) and on Jamestown Island (such as Back River marsh, Passmore Creek marsh, and Pitch and Tar Swamp). Upland and wetland forests are also included within this conservation site.

Under Alternative A, the No Action Alternative, existing impacts to these areas would include wave action associated with severe storms; native and invasive species competition, in particular with common reed (*Phragmites australis*); herbivory; channel migration; sea-level rise; sedimentation;

boating activities within the Back and James Rivers; shoreline stabilization and structural development; and changes in water quality due to boating within the area and increased development within the watershed.

For the action alternatives, B, C, and E would have the most effect on these sites, while Alternative D would have no additional impacts above those identified for Alternative A. Alternatives B, C, and E all propose the construction of boat docks and the addition of a water taxi/interpretive tour. Construction activities and the tour could potentially affect water quality within the conservation site, which would indirectly affect the wetland habitat.

The Mill Creek Marsh conservation site includes a small fringe tidal wetland along the northern shoreline of The Thorofare. General adverse impacts to this site would include changes in water quality (from increased development and water traffic).

Cumulative Impacts

Increases in local population could result in an increase of boat traffic on Sandy Bay and Back River, which could impact the bald eagle nest sites along Back River and The Thorofare and the sensitive joint-vetch population, as described under Alternative B. Although the park has no control over the regulation of these waters, installation of the boat docks associated with Alternatives B, C, and E; construction of the bridges in Alternatives B and E; and the posting of "no wake zones" would help limit the impact by slowing boat traffic passing the resources, reducing the impact of waves on plant resources near the shore and limiting noise that could disturb the eagles.

Cumulative impacts also include land use impacts from development adjacent to and surrounding the project site boundaries. Segmentation of prime habitat, loss of riparian buffers, and increases in watershed disturbance adversely affect rare, threatened, and endangered species through displacement and harassment.

Conclusion

Table 4-11 provides a list of which actions may or may not affect the bald eagle and/or the sensitive joint-vetch. All activities within the limits of the Jamestown Project would be managed to avoid or minimize impacts to rare, threatened, and endangered species. Originally, the hike/bike trail planned under Alternative B was to skirt the sensitive joint-vetch and pass very near (+120 feet) the bald eagle nest. Through coordination with the FWS, the proposed hike/bike trail under this alternative has been relocated to avoid impacts to the sensitive joint-vetch and reduce the impacts to the bald eagle nesting pair. As a result, new work associated with Alternative B, as well as the other proposed alternatives, is not expected to result in the ability of these species to exist within the park.

A long-term monitoring plan would be implemented to inventory and monitor impacts to eagles and sensitive joint-vetch and associated critical habitat areas. This monitoring would help determine impacts from increased visitation and changes in visitor use patterns, as well as effects of boat traffic.

In summary, Alternative B proposes the greatest impact to the federally-listed species. This alternative would impact nesting eagles and would contribute to the long-term loss of eagle nesting habitat on Neck of Land. Long-term losses to eagle habitat on Neck of Land would also occur with Alternatives C and E, with Alternative C having the greatest loss in this category. Alternative D proposes the fewest impacts to eagle habitat with the elimination of the bike trails and boating plan. Alternatives B, C, and E would also impact sensitive joint-vetch habitat in the project area. Increases in impervious area, potential increases in runoff, and adding boat docks and transport could adversely affect water quality and thus the sensitive joint-vetch and its habitat. Alternative D would pose no new threats to the sensitive joint-vetch or its habitat.

By implementing the suggested mitigation strategies, none of the alternatives would result in major impacts to listed species. Therefore, none of the alternatives would result in impairment of these important natural resources.

Table 4-11: Summary of Impacts to Federally-listed Species							
Alternative	Species	Action Causing Potential Impacts					
		Hike/Bike Trail	Island Parking Lot Renovations	New Visitor or Ticketing Center	Neck of Land Facilities	Boat Dock	Boat Route
B	Eagle	✓	✓	✓	✓	✓	✓
	SJV	✓			✓	✓	✓
C	Eagle		✓	✓	✓	✓	✓
	SJV				✓	✓	✓
D	Eagle						
	SJV						
E	Eagle	✓	✓	✓	✓	✓	✓
	SJV	✓			✓	✓	✓

*These activities would directly and/or indirectly impact the listed species.

4.3.2.10 Visual Quality and Aesthetics

This section considers impacts of each of the alternatives on the visual resources of the Jamestown Project site and areas adjacent to the Jamestown Project site, including the Colonial Parkway from Yorktown to Jamestown and the James River. The Jamestown Project site includes visual resources within its boundaries and to adjacent land and water. The existing visual quality is a vital resource of the Jamestown Project site and a major factor influencing the visitor experience during the approach to Jamestown Island and on the Island. Viewsheds were established based on the visitor approach to Jamestown on the Colonial Parkway as well as visitor approach from the James River by boat. Viewsheds to the project area begin from the Parkway prior to the boundary of the Jamestown Project site. Traveling west on the Parkway, there are views to the Island before reaching the NPS Maintenance Facility and Neck of Land.

Impacts to viewsheds both within and outside of the project boundaries are described as well as impacts to viewsheds from the project site to adjacent land uses and water resources. Also, the impacts to viewsheds along the Colonial Parkway and from the James River and Surry County are considered, as they are a major part of the visual experience of the Jamestown Project site. Actions introduced by the alternatives have potential impact on the viewsheds and the site's visual quality and therefore the overall character and beauty of the Jamestown Project site.

Methodology

A visual record of the existing viewsheds was compiled by traveling the Colonial Parkway and James River and systematically recording through photography the viewsheds as experienced by visitors. This includes visitors arriving by automobile, bicycle, or walking on the Colonial Parkway, and by boat from the James River. The viewsheds on the Island were documented by walking the site and recording the viewsheds that are predominant on the Island and from the Island

to adjacent land and water. This visual record chronicles what exists today and does not include any previous land uses or man-made features that no longer exist. Impacts to viewsheds are based on the extent and number of man-made features introduced into the viewsheds, either through the action alternatives or existing development on adjacent land. Intensity of impacts is defined as follows:

Negligible: An action that would introduce only the perception of some additional movement by cars or by people on bicycles or walking. The change to the viewshed would be so small or localized that it would have no measurable or perceptible consequence to the visitor experience of the viewshed.

Minor: An action that would introduce perceptible man-made additions to the viewshed. These actions would include structures that affect a relatively small portion of the viewshed, either the foreground, middleground, or background, and have barely perceptible visual consequences to the visitor experience of the viewshed.

Moderate: An action that would introduce perceptible man-made additions to the viewshed. These actions would include facilities, parking, and other man-made structures that would affect a moderate portion of the viewshed. This might include the foreground and middleground, or the foreground and background. These actions would not completely alter the viewshed, but would be a visual addition to the existing conditions.

Major: An action that would introduce multiple and drastic man-made additions that affect the entire viewshed as experienced by the visitor. These actions would include major facilities and parking plus other man-made structures that would completely alter the foreground, middleground, and background of the existing viewshed.

Effects of Alternative A (No Action Alternative)

Alternative A retains the existing buildings and infrastructure, with no major physical changes to the project site. Therefore, the major viewsheds that are impacted are those experienced from the Colonial Parkway and Jamestown Island toward existing land uses adjacent to the project site boundaries and across the James River to Surry County. Major sources of development that affect these viewsheds include the Jamestown Marina, Jamestown Settlement, and waterfront development in Surry County. There would also be impacts to viewsheds of Jamestown Island from the James River and Surry County and viewsheds on the Island due to ongoing archaeological activity and changes in interpretation due to these discoveries.

Impacts to Viewsheds from the Parkway

Development at Jamestown Marina

A moderate impact exists to Viewshed 4 and could potentially expand to a major impact if further development occurs at the existing Jamestown Marina. The existing viewshed is dominated by the Marina, with no visual screening. This view is a stark contrast to the scenic vistas along the Colonial Parkway and opposite the Marina at the Powhatan Creek Bridge. The potential for major impact increases if vegetative screening is not put into place.

Development at Jamestown Settlement

Moderate impacts exist in Viewsheds 6 and 7 as new construction continues at Jamestown Settlement. Existing conditions are already visible from the Parkway and Glasshouse area, but the largest proposed building for the Settlement would be a four-story brick structure, which would further impact these viewsheds. Proposed new parking facilities at Jamestown Settlement and the proposed redesign of Route 359 (access to the Settlement and the Island), would have a moderate impact to Viewsheds 6 and 7 as well as other consequences for transportation and visitor experience.

Waterfront Development in Surry County

Minor impacts exist in Viewsheds 11 and 13 from the Colonial Parkway to Surry County. These views to Surry County contain shoreline development and the Jamestown-Scotland Ferry landing. Changes in land use and/or zoning in Surry County may encourage more development. This is a potential moderate to major impact to the visual quality of the Jamestown Project site. Surry County is visible and part of the visitor experience within the project site from Powhatan Creek Bridge to Jamestown Island. Surry County is also visible from the Colonial Parkway before the project limits, where the views include the domes of the Surry Power Station.

Impacts to Viewsheds from the Island

Waterfront Development in Surry County

Minor impacts exist in Viewshed 17 due to development trends in Surry County. The views to Surry County contain shoreline development across the James River from Jamestown Island. Changes in land use and/or zoning in the future in Surry County may encourage more development. Existing minor impacts could potentially increase to major impacts affecting the visual quality from the Island. This is a critical viewshed because the James River and beyond to Surry County dominate the visitor experience from much of Jamestown Island.

Impacts to Viewsheds on the Island

Ongoing Archaeological Activity and Changes in Interpretation

Minor impacts exist in Viewsheds 18 and 19 on the Island due to archaeological activity and changes to interpretation based on new discoveries. Views over the historic site are affected by structures, such as the “white onion dome,” which protect archaeological sites and the posts marking the 1607 James Fort Site. New discoveries and methods of interpretation and protection of artifacts would potentially impact the existing viewsheds on Jamestown Island.

Impacts to Viewsheds from Glasshouse Point

Development at Jamestown Settlement

A moderate impact exists in Viewshed 20 due to the current Jamestown Settlement facilities that are visible from the Glasshouse parking area. Proposed construction, including a large multi-storied theater, would add further visual intrusion and would have a potentially major impact on Viewshed 20.

Impacts to Viewsheds from Surry County

Ongoing Archaeological Activity and Changes in Interpretation

Minor impacts exist in Viewsheds 21 and 23, as described above for “Impacts to Viewsheds on the Island.”

Impacts to Viewsheds from the James River

Ongoing Archaeological Activity and Changes in Interpretation

The items mentioned above for “Impacts to Viewsheds on the Island” would also impact visual conditions from the James River, Viewsheds 21 and 23.

Impacts Common to the Action Alternatives

New and expanded visitor services and interpretation at Jamestown Island, as well as expanded operations, are proposed in all of the action alternatives.

Impacts to Viewsheds on the Island

Proposed Footbridge from Parking Lot

The proposed pedestrian walkway from the existing parking lot to the Observation Building site does not impact any of the established viewsheds within the Jamestown Project site. However, this pedestrian walkway is designed to afford viewsheds that do not presently exist over the historic landscape and out to the James River. This is a beneficial impact for the visual resources of Jamestown Island.

Proposed Walkway Transition (Hub) on the Historic Site

The proposed changes to the 1907 Monument site to accommodate a visitor ‘hub’ and transition do not impact any of the established viewsheds within the project site. This “hub” creates new viewsheds looking south, east, and west to the historic site by removing the Bradford pear tree plantings from the 1907 Monument site. This allows the hub to function as a place where the visitor can see the Townsite and understand and decide how to experience it. This action would have a positive impact on existing Viewsheds 18 and 19.

Proposed Interpretive Anchor East, Agricultural Exhibit Area

The proposed Agricultural exhibit area located at the east end of the Townsite would have a minor visual impact for established Viewshed 18. The current open space and subsequent view of this open space would change with the construction of the exhibit. However the character of the Agricultural exhibit is designed to mimic natural features, keep structural construction at a bare minimum, and have agricultural activity so as not to be a blemish on the landscape. A small structure is proposed to dispense liquid refreshment to the visitor as they experience this end of the Townsite.

Proposed Interpretive Anchor West, the Ludwell Exhibit Facility

The proposed Ludwell exhibit facility located at the west end of the Townsite would have a moderate visual impact for established Viewshed 19. A new man-made element would be introduced to this area of the historic site. The facility would be partially screened in Viewshed 19 by large, existing trees. There are, however, constant changes to the historic site due to new discoveries, methods of interpretation, and new archaeological digs. Therefore an “established viewshed” in this area becomes temporary with different elements and character at different times.

Proposed Comfort Facility at Agricultural Exhibit

The proposed comfort facility at the Agricultural exhibit would have a minor impact on established Viewshed 18. The current open space would change with the construction of this small structure. The facility would be for visitor comfort and safety on this end of the Island. Design of this facility would be sensitive and in keeping with the general character of the Island landscape.

Proposed Ambler House Observation Platform

The proposed Ambler House observation platform would not impact any of the established viewsheds in the project site. The proposed observation platform would create new viewsheds from the Ambler House by elevating the visitor to the second floor and therefore opening up viewsheds of the Townsite that do not currently exist. This would be a beneficial addition to the visual resources of the Island.

Impacts to Viewsheds from Glasshouse Point

Improvement of Glasshouse Point Parking Lot

The proposed improvement of the Glasshouse Point parking lot would not impact Viewshed 20 or any other viewshed significant to the Jamestown Project site. The proposed improvements accommodate bus traffic and parking for buses and other large recreational vehicles. The viewshed from Glasshouse Point would be affected only by existing facilities and new construction at Jamestown Settlement.

Separate Hike/Bike Path from Glasshouse to Jamestown Settlement

The proposed construction of the hike/bike path from Glasshouse to Jamestown Settlement would not permanently impact any existing project viewshed. Construction methods would preserve the maximum amount of existing vegetation possible. Once the path is in place, new plantings would reestablish the existing thin buffer and could contribute additional screening.

Effects of Alternative B

Impacts to Viewsheds from the Parkway

Proposed Intermodal Transportation Terminal and Parking at Neck of Land

This new facility and parking would have a moderate impact on Viewsheds 2 and 3 from the Colonial Parkway to Neck of Land. The dense, wooded vegetation lost to construction would allow for views to parked vehicles. Views from the Parkway of parked vehicles are not uncommon, as most overlooks provide parking. However, this parking lot is larger and would require sensitive site planning, construction, and use of materials. Screening would occur by use of extensive landscape plantings and creative grading consistent with existing Colonial Parkway edges. Examples of this type of grading are in Photo 1 below. Other examples are at mileposts 28 and 34 on the Parkway. The impact on Neck of Land would be mitigated, once the grading is in place and the new plantings flourish.



Photo 1: Grading example along Colonial Parkway.

Proposed Hike/Bike Path on Neck of Land

The proposed hike/bike path on Neck of Land that follows the Old Route 31 road trace does not constitute an impact on the viewshed, due to new construction of a path. Any potential viewshed impact of this portion of the path would be from an increase in use by hikers and bicyclists. This movement of visitors would have negligible impact to Viewsheds 8, 9, and 12. This negligible impact would also be minimized as the numbers of visitors and the times they use this part of the path would vary.

As the path continues south and southeast, it changes to a boardwalk, which is higher than the existing asphalt path. This structure would have a moderate impact on Viewshed 12 due to the introduction of an elevated element in the landscape. The visibility of the boardwalk span would be especially prevalent in the background of Viewshed 12. Design details as well as building materials for this boardwalk would be in keeping with the visual quality and character of the Jamestown Project site. A boardwalk itself, out of context, is not a visually offensive structure. It would, however, pose a moderate visual impact from various vantage points when placed within a context and site setting.

Proposed Hike/Bike Bridge over Back River

The proposed bridge over Back River would have a moderate impact on Viewshed 12. The full span of the bridge would not be screened and would be visible within this viewshed. The vertical height of the bridge would have to allow for boat traffic, therefore making it even more visible. The bridge, however, would only be in the middle to background of the viewshed. Design details of the bridge as well as building materials would be used to create a bridge in keeping with the character of the area. Existing photographs of the previous bridge that spanned the Back River for automobile traffic prior to 1957 would serve as a reference for the design of the proposed hike/bike bridge.

Proposed Boat Dock at Neck of Land

The proposed boat dock at Neck of Land would have a minor impact to Viewshed 1-A. The viewshed originates out of the project site, but would contain the proposed boat dock in the foreground. The boat tour, which uses this dock, would create new viewsheds that do not currently exist for the visitor. These new viewsheds would enhance the visitor experience and provide new interpretive opportunities.

Proposed Boat Dock at Powhatan Creek Overlook

The proposed boat dock at Powhatan Creek Overlook and the walkway from the boat dock to the overlook parking would have impacts on Viewsheds 5, 8, and 9. There would be a minor impact to Viewshed 5, as the dock and walkway would occupy a small portion of the entire viewshed. Viewshed 8, originating from the Powhatan Creek Overlook, would have the boat dock and walkway as part of the foreground of the scenic vista. The proposed dock and walkway would not impact the long, panoramic views from the overlook toward the Island and the isthmus. Therefore, this would be a minor impact to Viewshed 8. There would also be a minor impact to Viewshed 9 as the dock and walkway would be only part of the long, scenic view. The boat concession proposed to stop at these docks would periodically pass through many established viewsheds, but would be temporary and does not constitute an additional visual impact to a particular viewshed. Current boat traffic runs through these established viewsheds.

Replacement Visitor Center and Educational Facility and Reconfiguration of Existing Parking Lot

The proposed Visitor Center and reconfiguration of the existing Island parking lot to accommodate this facility would have a moderate impact on Viewshed 14. As the visitor enters the parking lot, a canopy of trees, which screen the parking lot from Back River and the existing Visitor Center and Townsite, encloses the existing view.

In Alternative B, the viewshed remains enclosed, but a major structure meets the eye as well as canopied parking. Bus turn around and drop off would also become part of Viewshed 14. From the perspective of the visitor experience, the view of the replacement Visitor Center eliminates confusion as to destination and orientation, but the proposed action would have a moderate impact to Viewshed 14.

Proposed Boat Dock at Jamestown Island

The proposed boat dock at Jamestown Island would have a minor impact on established viewsheds from the Parkway. The boat dock would be visible from the existing Jamestown Island parking lot (Viewshed 15—considered part of the Colonial Parkway) and access road, but would be low and in the visual foreground; therefore, the impact would be minor.

Impacts to Viewsheds on the Island

Proposed Observation Building

No established viewsheds would be impacted by the proposed Observation Building located at the site of the existing Visitor Center. The total square footage and the footprint of the proposed Observation Building would be smaller than the existing building, and therefore the facility would intrude less on the historic site. This reduction would also open up more space for views to the entire historic site. The proposed Observation Building therefore would have a beneficial impact on the visual resources of the Townsite and 1607 James Fort Site.

Proposed Expansion of Jamestown Rediscovery™ Center

No established viewsheds would be impacted by the proposed expansion of the Jamestown Rediscovery™ Center, which would house both the APVA and NPS portions of the Jamestown collection.

Impacts to Viewsheds from the Island

Proposed Facilities at Neck of Land

The facility on Neck of Land would have a moderate impact on Viewshed 15. Due to the extent of the proposed action, full screening would not be possible and portions of the facility would become part of the far background of Viewshed 15.

Proposed Hike/Bike Path on Neck of Land

The portion of the hike/bike path on Neck of Land that would follow the Old Route 31 road trace would not constitute an impact on Viewshed 15. Movement of visitors on this path would have negligible impact to Viewshed 15. As the path moves south and southeast, it changes to a wetland boardwalk, which would be higher than the existing asphalt path. This structure would have a moderate visual impact on Viewshed 15 due to the introduction of an elevated element in the landscape. Design details as well as building materials for this boardwalk would be in keeping with the visual quality and character that exist on the project site.

Proposed Hike/Bike Bridge over Back River

The proposed bridge over Back River would have a moderate impact on Viewshed 15. The vertical height of the bridge would have to allow for boat traffic, therefore making it even more visible. Design details as well as building materials for this bridge would be in keeping with the visual quality and character that exist on the Jamestown Project site.

Effects of Alternative C

Impacts to Viewsheds from the Parkway

Proposed Facilities at Neck of Land

This facility includes a new Visitor Center, NPS collections storage and research, and Intermodal Transportation Terminal as well as parking for 300 cars and 20 buses. Such a large facility would

be a major visual impact on Viewsheds 2 and 3 from the Colonial Parkway to Neck of Land. The dense, wooded vegetation lost to construction would allow for Parkway views to parked vehicles and a large structure. Views to parked vehicles are not uncommon to the Parkway, as cars are often parked in overlooks. However, this parking lot would be larger and the proposed facility is also quite extensive and would require creative methods of construction and use of materials. Screening would occur by use of extensive landscape plantings and creative grading consistent with existing Colonial Parkway edges (see Photo 1 above). However, the size of the building and the number of parking spaces in this alternative would require significant clearing of vegetation, which screening and grading cannot totally mitigate. Due to the size of this facility and the parking, there would also be moderate visual impacts to Viewsheds 12 and 15.

Proposed Boat Dock at Powhatan Creek Overlook

This action is the same as proposed under Alternative B; therefore, impacts to Viewsheds 5, 8, and 9 from the Parkway would be the same as those described for Alternative B.

Proposed Boat Dock at Neck of Land

This action is the same as proposed under Alternative B; therefore, impacts to Viewshed 1-A from the Parkway would be the same as those described for Alternative B.

Proposed Ticketing Facility in Existing Parking Lot and Reconfigured Existing Parking Lot

The proposed ticketing facility and reconfiguration of the existing Island parking lot to accommodate this facility would have a minor impact on Viewshed 14. The view as the visitor enters the parking lot is currently enclosed, with trees screening views from the parking lot to Back River and to the existing Visitor Center and Townsite. In this alternative, the viewshed would

remain enclosed, but a small structure meets the eye as well as canopied parking and pedestrian space. A bus turn around and drop off would also be visible in Viewshed 14. From the perspective of the visitor experience, this eliminates a lot of confusion as to destination and orientation.

Proposed Boat Dock at Jamestown Island

This action is the same as proposed under Alternative B; therefore, impacts to Viewshed 15 would be the same as those described for Alternative B.

Impacts to Viewsheds on the Island

Proposed Observation Building

This action is the same as proposed under Alternative B; therefore, the beneficial impacts to viewsheds on the Island would be the same.

Impacts to Viewsheds from the Island

Proposed Facilities at Neck of Land

The facility on Neck of Land would have a moderate impact on Viewshed 15. Due to the extent of the proposed action, full screening would not be possible and parts of the facility would become part of the far background of Viewshed 15.

Effects of Alternative D

Impacts to Viewsheds on the Island

Proposed Visitor Center/Collections/ Observation Building Facility

This multi-storied facility would have an impact on the visual character of Jamestown Island. This includes Viewsheds 18 and 19. The building's proposed scale and location (at the site of the existing Visitor Center) would punctuate the historic site and create a building visually dominant from anywhere on the Island. The structure would obstruct views from the proposed

pedestrian footbridge and views from one side of the historic site to another. Its vertical size would dominate the landscape and diminish the existing scale and visual character of the Island.

Impacts to Viewsheds from Surry County and the James River

Proposed Visitor Center/Collections/ Observation Building Facility

This facility would have a moderate impact on Viewshed 21 from the James River and Surry County. It would be the dominant feature within the Island landscape, as seen from the James River and from Surry County and would diminish the sense of natural, unspoiled area for boaters passing on the James.

Effects of Alternative E

Impacts to Viewsheds from the Parkway

Proposed Intermodal Transportation Terminal and Parking at Neck of Land

This new facility and parking would have a moderate visual impact on Viewsheds 2 and 3 from the Colonial Parkway to Neck of Land, as described under Alternative B.

Hike/Bike Path on Neck of Land

The proposed hike/bike path on Neck of Land would include an asphalt path going west to the wetland and then the path would become a boardwalk, continuing west toward Powhatan Creek. The proposed boardwalk would have moderate impacts on Viewsheds 5, 8, and 9 due to the introduction of an elevated element in the landscape and also, the visibility of the boardwalk span. The boardwalk, however, would not occupy the foreground, middleground, and background of each viewshed. The existing landscape is wetland and this alternative proposes a structure with some vertical height that is directly in the viewsheds. There would also be people walking and on bicycles that would become a visible part

of the viewsheds. This potential impact would be minimized as the numbers of visitors and the times they use this part of the path would vary. Design details as well as building materials for the boardwalk would be in keeping with the visual quality and character that exist on the project site. A boardwalk itself, out of context, is not a visually offensive structure. It does have a direct visual impact from various vantage points, however, when placed within a context and the site setting.

Hike/Bike Bridge over Powhatan Creek

The proposed bridge over Powhatan Creek would have a moderate impact on Viewsheds 5, 8, and 9. The full span of the bridge would not be screened and would be visible within these viewsheds. The bridge, however, would not occupy the foreground, middleground, and background of each viewshed. This bridge is required to have vertical clearance for all boat traffic, which gives it added visibility in these viewsheds. Design details as well as building materials for this bridge would be in keeping with the visual quality and character that currently exist on the project site.

Replacement Visitor Center and Reconfigured Existing Parking

The replacement Visitor Center and reconfiguration of the existing Island parking lot to accommodate this facility would have a moderate impact on Viewshed 14, as described for Alternative B.

Boat Dock at Neck of Land

This action is the same as proposed under Alternative B; therefore, minor impacts to Viewshed 1-A from the Parkway would be the same as those described for Alternative B.

Boat Dock at Jamestown Island

This action is the same as proposed under Alternative B; therefore, minor impacts to Viewshed 15 from the Parkway would be the same as those described for Alternative B.

Impacts to Viewsheds on the Island

Proposed Observation Building

The proposed Observation Building, located at the site of the existing Visitor Center, would impact no established viewsheds. The total square footage and building footprint of the proposed Observation Building would be smaller than the existing building (2,500 square feet versus 29,000 square feet), and therefore the facility would intrude less on the historic site. This reduction in square footage would also open up more space for views to the entire historic site. The proposed Observation Building would therefore have a beneficial impact on the visual resources of the historic site.

Impacts to Viewsheds from the Island

Intermodal Transportation Terminal and Parking at Neck of Land

The facility on Neck of Land would have a minor impact on Viewshed 15, as described for Alternative B.

Cumulative Impacts

The development in Surry County along the banks of the James River would have a negligible visual impact on Viewshed 16 and a moderate visual impact on Viewshed 17. Visitors at major facilities on the Island and the major walkway along the edge of the water have direct and unobstructed views of the development in Surry. This development is a constant part of the viewshed and influences the visitor experience of Jamestown Island. There would be a potential major impact to these viewsheds by uncontrolled development in Surry. Though this is not an action proposed in any alternative by the APVA and NPS, it would potentially impact the visual quality and aesthetics of the Jamestown Island experience. The NPS and APVA would monitor development and zoning plans in Surry and enlist cooperation from planning officials.

Additionally, changes in viewsheds, which include the Jamestown Marina and the Jamestown Settlement, contribute to cumulative impacts. While there is little to be done about the Jamestown

Settlement development plans already underway, the APVA and NPS will monitor other private development, such as at the Marina, and participate in design review with James City County as well as zoning hearings.

Conclusion

There are proposed facilities in all the action alternatives that directly impact one or more of the existing viewsheds at Jamestown. If analyzed viewshed by viewshed, a major impact at one location does not adversely impact the overall visual resource. The entire visual experience, including access to the Island and the Island itself, must be evaluated in order to determine intensity of impact and impairment to the visual resource.

Due to the differences in the alternatives of the proposed locations for facilities, transportation, amenities, and exhibits, no alternative would impair the entire visual resource at Jamestown. There would be moderate overall impacts in Alternatives B, C, and E. This is due to the facilities proposed at Neck of Land and the additional boat docks. Alternative D, overall, would result in a minor impact on the visual resource, but this alternative does have a major impact on the Island due to the size of the renovated Visitor Center/NPS Collections/Observation Building facility.

Within project boundaries, temporary visual intrusions would occur in the vicinity of construction activities associated with new visitor facilities. Introduction of new structures and removal of vegetation as required during construction would result in potential long-term moderate to major impacts to the visual and aesthetic environment of specific areas within the site, particularly at the site of the proposed facilities at Neck of Land and in the existing Island parking lot.

Appropriate design and landscaping techniques would be used to reduce visual intrusiveness, and facilities would be located to take advantage of existing vegetative screening. Trees, shrubs, and other native vegetation would be planted at facilities and parking areas as necessary to mitigate visual impacts and enhance the visual perception of the

new facilities. In addition, vegetative screening may also be added in areas where an established viewshed is currently adversely affecting the visitor experience, such as at the Jamestown Marina, north of Powhatan Creek Bridge.

Table 4-12 summarizes the impacts that each alternative has on the individual, established viewsheds.

Table 4-12: Summary of Adverse Impacts to Visual Quality and Aesthetics

Viewshed	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
1-A	—	Minor	Minor	—	Minor
1	—	—	—	—	—
2	—	Moderate	Major	—	Moderate
3	—	Moderate	Major	—	Moderate
4*	Moderate	Moderate	Moderate	Moderate	Moderate
5	—	Minor	Minor	—	Moderate
6*	Moderate	Moderate	Moderate	Moderate	Moderate
7*	Moderate	Moderate	Moderate	Moderate	Moderate
8	—	Minor	Minor	—	Moderate
9	—	Minor	Minor	—	Moderate
10	—	—	—	—	—
11*	Minor	Minor	Minor	Minor	Minor
12	—	Moderate	Moderate	—	Negligible
13*	Minor	Minor	Minor	Minor	Minor
14	—	Moderate	Minor	—	Moderate
15	—	Moderate	Moderate	—	Minor
16	—	—	—	—	—
17*	Minor	Moderate	Moderate	Moderate	Moderate
18	Minor	Minor	Minor	Major	Minor
19	Minor	Moderate	Moderate	Major	Moderate
20*	Moderate	Moderate	Moderate	Moderate	Moderate
21	Minor	Minor	Minor	Moderate	Minor
22	—	—	—	—	—
23	Minor	Negligible	Negligible	Minor	Negligible
24	—	—	—	Minor	—
Overall Impact	Minor	Moderate	Moderate	Minor	Moderate

*Existing viewsheds outside the project boundary area that are already adversely impacted.

4.3.2.11 Air Quality

Methodology

The air quality study evaluated the changes in air quality due to project-related motor vehicle traffic associated with the implementation of the Jamestown Project alternatives. The air quality study included a microscale analysis to evaluate the local carbon monoxide (CO) concentrations at sensitive receptor locations and a mesoscale analysis to evaluate the regional ozone precursor emissions of volatile organic compounds (VOCs) and nitrogen oxides (NOx). The following is a discussion of the results of the air quality study as compared to the Virginia and National Ambient Air Quality Standards (NAAQS) for CO and ozone in the study area.

For this section, the intensity of air quality impacts are defined as follows:

Negligible: An action that would result in no increase or reductions in pollution levels when compared to the No Action Alternative. Pollution levels would remain below the NAAQS. The results of such actions would have no noticeable effect on air quality.

Minor: Minor impacts would result from actions with relatively small increases in pollution levels when compared to the No Action Alternative. Pollution levels would remain below the NAAQS. The results of such actions would have no noticeable effect on air quality.

Moderate: An action that would increase pollution levels by 10% or greater when compared to the No Action Alternative. However, the total pollution levels would remain below the NAAQS. The results of such actions would have no noticeable effect on air quality.

Major: An action that would increase pollution levels by an amount under the action alternative that would result in pollution levels that exceed the NAAQS. The results of such actions would have a substantial effect on air quality.

Effects of the Alternatives

Alternative A would have minor short-term and negligible long-term impacts. The microscale analysis shows future CO concentrations would be equal to or less than existing for two of the four intersections during the peak traffic hour. During other hours of the day, CO concentrations would be lower. The mesoscale analysis shows future VOC and NOx daily emissions to be slightly higher than existing levels, which is consistent with the increase in traffic volumes in the future.

Each of the action alternatives (B, C, D, and E) would have minor short-term and negligible long-term impacts because for each of these alternatives, future pollution levels of CO, VOCs, and NOx would either remain the same as or increase by 5% or less compared to Alternative A (No Action Alternative) pollution levels.

Microscale Analysis

A microscale analysis was conducted to determine whether the proposed project complies with the 1990 Clean Air Act Amendments (CAAA) and the Virginia State Implementation Plan (SIP) criteria. The four intersections that were modeled for the microscale analysis were presented in Figure 3-26. These intersections were selected for analysis because they were ranked as potential air quality impacts based on their traffic volumes and level of service. Tables 4-13 and 4-14 present the maximum predicted 1-hour and 8-hour CO concentrations, respectively, for each of the alternatives in the year 2020.

The results of the microscale analysis show that, under all future conditions (2020 No Action and Action Alternatives), predicted CO concentrations at all receptor locations are below or equal to predicted concentrations for the existing conditions in 2001. These reductions in CO concentrations can be attributed to more efficient vehicles with enhanced emissions control technologies as mandated by the Federal Motor Vehicle Exhaust Emissions Control Program for new vehicles entering the fleet. The results of the microscale analysis also demonstrate

that the proposed project satisfies the SIP criteria for CO because all the 2001, 2020 No Action, and 2020 action alternatives CO concentrations (both 1- and 8-hour values) are below the NAAQS of 35 and 9 parts per million (ppm), respectively.

The microscale analysis selected multiple worst-case receptor locations for each intersection. Typically, one location close to the roadways was selected in each quadrant for each intersection, as required by EPA. Receptor locations that are further away would have lower CO concentrations. The following is a discussion of the air quality results for the specific intersections.

State Route 31 (Jamestown Road) and Route 359

Three receptor locations were evaluated for this intersection area. Table 4-13 presents the results of the 1-hour microscale analysis. As shown in Table 4-13, under 2020 Alternative A (the No Action

Alternative), the maximum predicted CO concentrations range from 4.5 to 4.7 ppm. The maximum predicted 1-hour concentrations under the 2020 action alternatives range from 4.5 to 4.7 ppm. In 2020, compared to the No Action Alternative, all three receptors would experience the same concentrations under the 2020 Alternatives B, C, D, and E. Predicted maximum 1-hour concentrations at this intersection area fall below the NAAQS of 35 ppm for all conditions analyzed.

The maximum predicted 8-hour CO concentrations for the three receptors analyzed at this intersection area are presented in Table 4-14. Since these 8-hour concentrations were derived by applying a persistence factor of 0.7 to the 1-hour concentrations, the comparison between alternatives is similar to that previously described under the 1-hour analysis. Under all conditions analyzed, maximum predicted concentrations are below the 8-hour NAAQS of 9 ppm.

Table 4-13: Predicted Maximum 1 Hour CO Concentrations (Parts Per Million)

Receptor Locations	2001 Existing**	2020 Alt.A	2020 Alt.B	2020 Alt.C	2020 Alt.D	2020 Alt.E
State Route 31 (Jamestown Road) and State Route 359						
1. West Side of Route 31	5.3	4.7	4.7	4.7	4.7	4.7
2. Jamestown Settlement Parking Lot (West side)	5.4	4.7	4.7	4.7	4.7	4.7
3. Jamestown Settlement Visitor Center (West side)	5.3	4.5	4.5	4.5	4.5	4.5
Colonial Parkway and State Route 359						
1. East Side of Colonial Parkway	4.5	4.5	4.5	4.3	4.5	4.5
2. Jamestown Settlement Parking Lot (East side)	5.4	4.7	4.7	4.7	4.7	4.7
3. Jamestown Settlement Visitor Center (East side)	4.8	4.4	4.4	4.4	4.4	4.4
State Route 31 (Jamestown Road) and State Route 199						
1. Prudential Realty Office	9.2	8.5	9.0	9.0	8.7	8.9
2. CVS Convenience Store	8.8	8.1	8.6	8.6	8.3	8.3
3. Sun Trust Bank and Office Park	8.5	8.0	8.6	8.6	8.2	8.3
4. 7 11 Convenience Store	8.3	7.7	8.1	8.1	7.9	8.0
Colonial Parkway and State Route 199						
1. Open Space Northeast Quadrant	5.9	6.4	6.9	6.9	6.8	6.8
2. Open Space Southeast Quadrant	6.3	6.8	7.3	7.3	7.0	7.0
3. Open Space Southwest Quadrant	6.6	7.3	7.9	7.9	7.5	7.5
4. Open Space Northwest Quadrant	5.3	5.8	6.2	6.2	6.0	6.0

* The concentrations are expressed in parts per million (ppm) and include a 1-hour background concentration of 3.0 ppm.

** The 1-hour NAAQS for CO is 35 ppm.

Colonial Parkway and Route 359

Three receptor locations were evaluated for this intersection area. Table 4-13 presents the results of the 1-hour microscale analysis. As shown for the 2020 Alternative A (the No Action Alternative), the maximum predicted CO concentrations range from 4.4 to 4.7 ppm. The maximum predicted 1-hour concentrations under the 2020 action alternatives range from 4.3 to 4.7 ppm. In 2020, compared to the No Action Alternative, all three receptors would experience the same concentrations under the 2020 Alternatives B, D, and E. Under 2020 Alternative C, one receptor would experience slightly lower concentrations, while the other two remain the same as the No Action Alternative.

Predicted maximum 1-hour concentrations at this intersection area fall below the NAAQS of 35 ppm for all conditions analyzed.

The maximum predicted 8-hour CO concentrations for the three receptors analyzed at this intersection area are presented in Table 4-14. Since these 8-hour concentrations were derived by applying a persistence factor of 0.7 to the 1-hour concentrations, the comparison between alternatives is similar to that previously described under the 1-hour analysis. Under all conditions analyzed, maximum predicted concentrations are below the 8-hour NAAQS of 9 ppm.

State Route 31 (Jamestown Road) and State Route 199

Four receptor locations were evaluated for this intersection area. Table 4-13 presents the results of the 1-hour microscale analysis. As shown under Alternative A (the No Action Alternative), the maximum predicted CO concentrations range from 7.7 to 8.5 ppm.

Table 4-14: Predicted Maximum 8 Hour CO Concentrations (Parts Per Million)						
Receptor Locations	2001 Existing**	2020 Alt.A	2020 Alt.B	2020 Alt.C	2020 Alt.D	2020 Alt.E
State Route 31 (Jamestown Road) and State Route 359						
1. West Side of Route 31	3.7	3.3	3.3	3.3	3.3	3.3
2. Jamestown Settlement Parking Lot (West side)	3.8	3.3	3.3	3.3	3.3	3.3
3. Jamestown Settlement Visitor Center (West side)	3.7	3.2	3.2	3.2	3.2	3.2
Colonial Parkway and State Route 359						
1. East Side of Colonial Parkway	3.2	3.2	3.2	3.0	3.2	3.2
2. Jamestown Settlement Parking Lot (East side)	3.8	3.3	3.3	3.3	3.3	3.3
3. Jamestown Settlement Visitor Center (East side)	3.4	3.1	3.1	3.1	3.1	3.1
State Route 31 (Jamestown Road) and State Route 199						
1. Prudential Realty Office	6.4	6.0	6.3	6.3	6.1	6.2
2. CVS Convenience Store	6.2	5.7	6.0	6.0	5.8	5.8
3. Sun Trust Bank and Office Park	6.0	5.6	6.0	6.0	5.7	5.8
4. 7 11 Convenience Store	5.8	5.4	5.7	5.7	5.5	5.6
Colonial Parkway and State Route 199						
1. Open Space Northeast Quadrant	4.1	4.5	4.8	4.8	4.8	4.8
2. Open Space Southeast Quadrant	4.4	4.8	5.1	5.1	4.9	4.9
3. Open Space Southwest Quadrant	4.6	5.1	5.5	5.5	5.3	5.3
4. Open Space Northwest Quadrant	3.7	4.1	4.3	4.3	4.2	4.2

* The concentrations are expressed in parts per million (ppm). The 8-hour concentrations were calculated using a persistence factor of 0.7.

** The 8-hour NAAQS for CO is 9 ppm.

The maximum predicted 1-hour concentrations under the 2020 action alternatives range from 7.9 to 9.0 ppm. In 2020, compared to the No Action Alternative, all four receptors would experience slightly higher concentrations under the 2020 Alternatives B, C, D, and E. Overall, predicted maximum 1-hour concentrations at this intersection area fall below the NAAQS of 35 ppm for all conditions analyzed.

The maximum predicted 8-hour CO concentrations for the four receptors analyzed at this intersection area are presented in Table 4-14. Since these 8-hour concentrations were derived by applying a persistence factor of 0.7 to the 1-hour concentrations, the comparison between alternatives is similar to that previously described under the 1-hour analysis. Under all conditions analyzed, maximum predicted concentrations are below the 8-hour NAAQS of 9 ppm.

Colonial Parkway and State Route 199

Four receptor locations were evaluated for this intersection area. Table 4-13 presents the results of the 1-hour microscale analysis. As depicted for Alternative A (the No Action Alternative), the maximum predicted CO concentrations range from 5.8 to 7.3 ppm. The maximum predicted 1-hour concentrations under the 2020 action alternatives range from 6.0 to 7.9 ppm. In 2020, compared to the No Action Alternative, all four receptors would experience slightly higher concentrations under the 2020 Alternatives B, C, D, and E. As with the other intersections analyzed, predicted maximum 1-hour concentrations fall below the NAAQS of 35 ppm for all conditions analyzed.

The maximum predicted 8-hour CO concentrations for the four receptors analyzed at this intersection area are presented in Table 4-14. Since these 8-hour concentrations were derived by applying a persistence factor of 0.7 to the 1-hour concentrations, the comparison between alternatives is similar to that previously described under the 1-hour analysis. Under all conditions analyzed, maximum predicted concentrations are below the 8-hour NAAQS of 9 ppm.

Mesoscale Analysis

The air quality study included a mesoscale analysis to evaluate the Jamestown Project’s impact on regional emissions. This mesoscale analysis was conducted for existing and future year emissions for each alternative to demonstrate that the project complies with the CAAA and SIP criteria.

The mesoscale analysis evaluated the change in daily (24-hour period) VOC and NOx emissions due to the proposed project. The total pollutant burden for vehicles affected by the proposed project was calculated for the study area under existing (2001) and future (2020) No Action (Alternative A) and action (B, C, D, and E) alternatives. By conducting an air quality analysis for these conditions, the relative impacts of each alternative were identified. Table 4-15 presents the estimated pollutant burden of VOCs and NOx for the existing conditions in 2001 and they alternatives in 2020.

The 2001 existing vehicle emissions estimates presented in Table 4-15 were calculated as a baseline for comparing future-year emissions.

Table 4-15: Mesoscale Analysis Results (kilograms per day)

Pollutant	2001 Existing Conditions	2020 Alternative A (No Action)	2020 Alternative B	2020 Alternative C	2020 Alternative D	2020 Alternative E
Volatile Organic Compounds	1,707.5	1,759.5	1,852.9	1,852.2	1,797.6	1,810.0
Nitrogen Oxides	2,443.4	3,110.6	3,243.8	3,243.0	3,164.6	3,182.8

The 2001 existing conditions estimates represent emissions related to those vehicles that currently travel to the Jamestown Project area. The VOC emissions from the 2001 existing conditions were estimated to be 1,707.5 kilograms per day (kg/day). Under 2020 Alternative A (No Action), VOC emissions were estimated to be 1,759.5 kg/day. The 2020 No Action VOC emissions are higher than the 2001 emissions due to the growth in traffic volumes over the 19-year period. Under 2020 Alternative B, VOC emissions were estimated to be 93.4 kg/day higher than 2020 No Action emissions, while for 2020 Alternative C, VOC emissions were estimated to be 92.7 kg/day higher than 2020 No Action emissions. For 2020 Alternatives D and E, VOC emissions were estimated to be 38.1 and 50.5 kg/day higher than 2020 No Action emissions, respectively. Under all four 2020 Action alternatives, VOC emissions are predicted to be higher than 2020 No Action emissions because more visitor traffic is expected as a result of proposed improvements.

The predicted NO_x emissions for the existing conditions in 2001 are 2,443.4 kg/day. Under the 2020 Alternative A (No Action), NO_x emissions are estimated to be 3,110.6 kg/day. Similar to VOC emissions, the 2020 No Action NO_x emissions are higher than the 2001 emissions due to the growth in traffic volumes over the 19-year period. Under 2020 Alternative B, NO_x emissions were estimated to be 133.2 kg/day higher than 2020 No Action emissions, while for Alternative C, NO_x emissions were estimated to be 132.4 kg/day higher than 2020 No Action emissions. Under 2020 Alternatives D and E, NO_x emissions were estimated to be 54.0 and 72.2 kg/day higher than 2020 No Action emissions, respectively. For all four 2020 action alternatives, NO_x emissions are predicted to be higher than 2020 No Action emissions because more visitor traffic is expected as a result of proposed improvements.

Other Impacts

In addition to the impacts to air quality related to increases in traffic conditions, short-term impacts would also result from construction of proposed facilities. This would include fugitive dust as well as

emissions from the machinery and transport vehicles. The NPS would monitor construction to limit the spread of fugitive dust, where possible. Additional long-term impacts to air quality pollution may result from the operation of the interpretive boat tour and water taxi. Depending on the type of boat used (electric or gasoline), noxious fumes may add to the emissions from increased traffic. In order to minimize this impact, an environmentally friendly engine would be used, and the NPS would monitor the effect of boat traffic on air quality conditions.

Cumulative Impacts

Cumulative impacts to air quality would result from future development actions both within the project site and the surrounding areas. Population increases would naturally generate more traffic in the area, which would also add to air quality impacts. However, emissions cause by any alternative would consequently have a negligible cumulative impact on the overall air quality of the area compared to other pollution sources (i.e. industry, commuter traffic, power plants).

Conclusion

The air quality study demonstrates that the Jamestown Project and its alternatives comply with the 1990 Clean Air Act Amendments and the Virginia State Implementation Plan criteria. The microscale analysis demonstrated that the carbon monoxide concentrations are below the National Ambient Air Quality Standards for all of the action alternatives. The mesoscale analysis calculated the emissions of VOCs and NO_x for the existing conditions in 2001 and the alternatives in the year 2020. Under all four 2020 action alternatives, VOC and NO_x emissions are predicted to be higher than 2020 No Action emissions because more visitor traffic is expected as a result of proposed improvements. Alternative D results in the smallest emissions increase by the year 2020.

Because none of the alternatives would result in major impacts to air quality, there would be no impairment this important resource by any of the proposed actions.

4.3.2.12 Noise

Methodology

The noise analysis predicted future sound levels for each of the receptor locations and compared them to the existing sound levels to evaluate potential noise impacts. The noise analysis predicted changes in sound levels for the 2020 action conditions based upon changes in traffic volumes and modal split (increased bus volumes, specifically). For example, automobile and truck volumes on the Colonial Parkway and Route 31 were grown by an annual rate of 2%, traffic volumes on the Loop Drive were grown by 0.5%, and automobile traffic volumes on the Island were reduced by 25% to reflect the expectation that visitors would choose to use the expanded shuttle service, ferry service, and bicycle trails to access this area. The bus traffic volumes were important to the noise analysis. The shuttle bus volumes were taken directly from “Table 4-25: Year 2020 Peak Hour Vehicle Trip Projections for Jamestown Island.” Conservative assumptions were used to identify the peak design day for the worst-case month for bus demand, which was May. This table indicated that four additional shuttle buses per hour for Alternative A, and five additional shuttle buses per hour for Alternatives B, C, D, and E would be added to each roadway link in the noise analysis.

The projected traffic volumes and operating conditions indicated that the noise analysis could combine the alternatives into two groups for the purpose of the noise analysis:

- Alternative A, (No Action) and
- Alternatives B, C, D, and E.

The intensity of noise impacts are defined as follows:

Negligible: An action that would result in no increase or reductions in sound levels when compared to existing sound levels. Predicted sound levels would remain below the Noise Abatement Criteria (NAC). The results of such actions would have no noticeable effect on ambient sound levels.

Minor: Minor impacts would result from actions with relatively small increases (1 to 2 dBA [A-weighted decibel]) in sound levels when compared to existing sound levels. Predicted sound levels would remain below the NAC. The results of such actions would have no noticeable effect on ambient sound levels.

Moderate: An action that would increase sound levels by a moderate amount (2 to 8 dBA) when compared to existing sound levels. Predicted sound levels would remain below or equal to the NAC. The results of such actions would have slightly noticeable effects on ambient sound levels.

Major: An action that would increase noise pollution levels by a substantial amount (9 dBA or greater) when compared to existing sound levels. Predicted sound levels would be equal to or exceed the NAC. The results of such actions would have slightly noticeable effects on ambient sound levels.

Effects of the Alternatives

For each of the Jamestown Project alternatives, items that would potentially impact noise quality include increases in automobile and bus traffic, increases in boat traffic, and temporary increases related to construction (only under the action alternatives). The results of the noise analysis indicated that none of the Jamestown Project alternatives would result in noticeable adverse noise impacts. All of the receptor locations are expected to experience a 1 to 2 dBA increase in sound levels compared to existing conditions. This increase in sound level is barely perceivable to the human ear and would not result in a noticeable adverse noise impact.

Each of the alternatives (A, B, C, D, and E) would have minor short-term and long-term impacts, because, for each of these alternatives, future noise levels would be 1 to 2 dBA higher than existing noise levels for the peak hour, while during other hours of the day the increase would be less.

Specific results of the noise analysis are presented in Table 4-16. These results predict an increase of sound levels of approximately 1 to 2 dBA at receptor locations 1 through 8. No substantial change in sound levels are expected at any of the receptor locations due to the Jamestown Project alternatives. However, the sound levels at Receptors 3, 5, 6, and 7 (which is approximately 12 miles from the Jamestown Project site) already approach or exceed the NAC, under existing conditions, and are expected to continue to do so under implementation of any of the alternatives.

Mitigation

While the noise analysis did not identify any noticeable adverse noise impacts due to the Jamestown Project Alternatives, several receptor locations were identified as experiencing high sound levels (3, 5, 6, and 7). The following measures could result in reduced sound levels. The predominant project-related noise sources (buses) generate their highest sound levels when they are traveling at high speeds and when they are idling.

The NPS would develop a plan to:

- Minimize bus travel speeds in the, Jamestown Project study area,
- Minimize bus idling time,
- Evaluate the locations of the bus waiting areas, and
- Evaluate a sound wall blocking line of sight from the bus waiting area to historic areas.

New boat connections along the Back River and Powhatan Creek are proposed under Alternatives B, C, and E. These services would connect Jamestown Island with the Powhatan Creek Overlook and the Neck of Land parcel. Potential adverse impacts from this service could include noise from the boat engines, from docking activity, and from any horn or whistle use required for nautical safety. The NPS would develop a plan to evaluate noise mitigation measures for the boat service, such as requiring quiet engines or a sound wall, if Alternative B, C, or E is selected.

Table 4-16: Predicted Sound Levels

Receptor Number	Receptor Location	Measured Levels	2020 Sound Levels			
		Leq Existing (dBA)	Alt. A (dBA)	Alts. B, C, D, and E (dBA)	FHWA Criterion (dBA)	Change (dBA)
1	Historic Jamestowne Loop Drive	51	52	52	57	1
2	Historic Jamestowne Parking Area	53	53	53	67	<1
3	Jamestown Settlement – Route 31 at Route 359	65	66	66	67	1
4	Residences at Back River Lane	51	53	53	67	2
5	Colonial Parkway at College Creek pull-off	64	66	66	67	2
6	Colonial Parkway at the Isthmus pull-off	65*	66	66	67	1
7	Williamsburg Visitor Center – Route 132Y	69	71	71	67	2
8	Route 31 at Old Colony Lane	62	64	64	67	2

Source: Vanasse Hangen Brustlin, Inc.

* Wind noise was a substantial noise source at this location.

Cumulative Impacts

Cumulative impacts to noise quality within the area would include construction at the Jamestown Settlement, construction of the realigned Route 359, and increased vehicular and boat traffic due to general population increases. Potential mitigative strategies discussed above would help minimize these impacts.

In addition, the Commonwealth of Virginia is currently considering the realignment of Route 359 near the Jamestown Settlement. The purpose of this realignment would be to unite the Jamestown Settlement with its visitor parking lot. This realignment was not considered in this noise analysis because the design concept for Route 359 has not yet been approved. If Route 359 were to be moved away (north) from the front door of the Jamestown Settlement, as proposed, the traffic-related sound levels near the entrance area of the Settlement would substantially decrease.

Conclusion

The results of the noise analysis indicate that none of the Jamestown Project alternatives would result in noticeable adverse noise impacts. All of the receptor locations are expected to experience a 1 to 2 dBA increase in sound levels compared to existing conditions. This increase in sound level is barely perceivable to the human ear and would not result in a noticeable adverse noise impact. Overall impact would be minor for all alternatives; therefore, none of the alternatives would result in impairment of noise quality.

4.3.2.13 Hazardous Materials/Contamination

The objective of this section is to assess the likelihood of encountering hazardous materials during the implementation of the alternatives considered for the Jamestown Project. The presence of asbestos containing material (ACM), lead-based paint (LBP), and petroleum storage tanks at the buildings may present a risk of encountering the material during renovation/demolition activities. The known or potential hazardous materials were identified in "Chapter 3: Affected Environment."

Mitigation/Legal Requirements

The following paragraphs detail the actions that may need to be taken to mitigate for ACM, LBP, and other hazardous material (OHM) during renovation/demolition activities.

A licensed Asbestos Abatement Contractor must remove friable ACM (easily crushed or crumbled to powder by hand pressure) prior to disturbance. The EPA requires a 10-day notification prior to the start of work. The Commonwealth of Virginia Department of Labor requires a 20-day notification prior to the start of work.

Non-friable ACM are classified by EPA National Emission Standards for Hazardous Air Pollutants (NESHAP) as Category I non-friable materials (packings, gaskets, resilient flooring materials, and asphalt roofing products). NESHAP permits wet demolition of Category I non-friable materials that are in good condition during demolition. The landfill where the construction and demolition debris would be disposed must be informed that the waste contains non-friable ACM

If renovation activities do not affect LBP-coated building components, no further work needs to be conducted. If specific buildings would be demolished that are constructed of building components coated with LBP, sampling using the toxicity characteristic leachate procedure (TCLP) is required by EPA Resource Conservation and Recovery Act (RCRA) regulations (40 CFR, Part 261, Subpart C). If the results of TCLP testing indicate results greater than 5 milligrams per liter, the waste is classified as RCRA-Hazardous and must be packaged, transported, and disposed of as hazardous waste.

Demolition/renovation contractors should be provided with the x-ray fluorescence (XRF) screening results prior to commencement of work in accordance with Occupation Safety and Health Act (OSHA) Lead in Construction Standard regulations (29 CFR, Part 1926.62). If renovations include dust-

generating activities on LBP-coated building materials, such as sanding, grinding, chipping, sawing, welding, etc., the LBP must be removed prior to disturbance.

Other hazardous material identified during the limited building survey must be moved to another location during construction or properly removed, packaged, transported, and disposed in accordance with all federal, state, and local regulations governing hazardous waste management. Based on conversations with APVA and NPS representatives, the majority of the OHM identified would be relocated and reused, and therefore a large cost savings would be realized.

Mercury-containing light tubes and thermostats are regulated by RCRA, and polychlorinated biphenyl (PCB)-containing light ballasts are regulated by the Toxic Substance Control Act (TSCA). In order to dispose of these substances, NPS must obtain an EPA Generator ID number and hire a hazardous waste contractor to segregate, package, transport, and properly dispose of the hazardous waste.

Removal of any underground storage tanks (USTs) should be performed in accordance with local, state, and federal regulations. Local government permits should be obtained, and local government fire and/or building officials should be notified. The USTs should be emptied of all product, and the tanks should be cleaned and removed to prevent a release from the UST. Samples are not required to prove there was no contamination during the excavation; however, if contamination is observed, VDEQ does not require the collection of samples as proof. In addition, a closure assessment, including an updated Notification Form, should be submitted within 30 days of tank closure.

Methodology

To assess the likelihood of encountering hazardous materials during renovation/demolition activities, an environmental site assessment of the buildings within the Jamestown Project site was conducted.

The assessment included a review of UST files and maps provided by the APVA and NPs, site reconnaissance to identify OHMs, and a LBP and ACM survey of the buildings identified.

To identify spills and releases of hazardous materials within the project area, the following state and federal environmental databases were reviewed using Environmental Data Resources, Inc. (EDR): National Priorities List (NPL); Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS); Corrective Action Report (CORRACTS); Resource Conservation and Recovery Information System (RCRIS); Treatment, Storage and Disposal (TSD) facilities; RCRIS generators; state list of hazardous waste sites (SHWS); state list of spill sites; Solid Waste Management Facilities (SWF); registered USTs; registered aboveground storage tanks (AST); leaking underground storage tanks (LUST); Leaking Petroleum Storage Tanks (LTANKS); and public water supplies (PWS).

During the site reconnaissance, the hazardous materials in the buildings and related sheds were inventoried; the buildings were searched for evidence of current or previous USTs (manways, vent pipes, repair asphalt) and evidence of releases from existing hazardous material containers.

In conjunction with Vanasse Hangen Brustlin, Inc. (VHB), accredited Industrial Training Company (ITC) performed the ACM and LBP survey on May 14 and 15, 2001. Because the buildings were occupied, the surveys were limited in scope to accessible and observable areas. Limited demolition to access these areas was not performed. The inspection for suspect ACM was conducted by ITC in general accordance with guidelines published in the EPA's Asbestos Hazard Emergency Response Act (AHERA) (Title 40 CFR, Part 763, Subpart E) and NESHAP (40 CFR Part 61, Subpart M). Sampling procedures included the collection of at least two samples of all identified suspect homogeneous and non-friable materials from the areas surveyed. The

survey for suspect ACM consisted of visual inspection, sampling, and laboratory analyses. The inspection included both friable and non-friable suspect materials. Sample analyses were performed at the Scientific Laboratories, Inc., located in Midlothian, Virginia. Bulk sample analysis was performed using Polarized Light Microscopy with Dispersion Staining (PLM/DS) in accordance with EPA protocol (Title 40 CFR, EPA Method 600/R093/116, July 1993).

The lead-based point inspection was conducted by field screening all painted surfaces to be affected by renovation/demolition activities using a NITON CRF Spectrum Analyzer and collecting composite soil samples. The Virginia Department of Occupational Regulation (VDPOR) categorizes surfaces testing greater than 1.0 milligram of lead per square centimeter ($>1.0 \text{ mg/cm}^2$) as lead-based paint. Table 3-33 summarized the locations and conditions of LBP materials identified in the survey. If renovation activities do not affect LBP-coated building components, no further work is necessary. If specific buildings would be demolished that are constructed of building components coated with LBP, sampling using the toxicity characteristic leachate procedure (TCLP) is required by EPA RCRA regulations (40 CFR, Part 261, Subpart C). If the results of TCLP testing indicate results greater than 5.0 milligrams per liter, the waste is classified as RCRA-Hazardous and must be packaged, transported and disposed of as hazardous waste. Demolition/renovation contractors should be provided with the XRF screening results prior to commencement of work in accordance with OSHA Lead in Construction Standard regulations (29 CFR, Part 1926.62).

Soil samples were collected along the perimeter of buildings (drip lines from the roof) whose exterior was identified as contaminated and damaged (peeling and flaking). Soil samples were typically collected within 6 inches of the soil surface. Soil sample analysis was performed using Atomic Absorption Spectrometry (AAS) in accordance with

EPA protocol (Title 40 CFR, EPA Method 600/R093/200). Soil samples containing greater than 400 ppm of lead are considered EPA levels of concern for high contact areas.

The information obtained during the site reconnaissance was overlain on the alternatives maps. Areas that would be impacted were determined and analyzed.

The analysis of the impacts to hazardous materials and contamination herein is based on the data obtained through the LBP and ACM surveys; site visits; review of federal, state, and local databases; and review of NPS and APVA files. It should be noted that impacts in this context could be beneficial or adverse. The following level of intensity definitions were used during the assessment:

Negligible: An action that would have a very small impact to the risk to human health and the environment. The results of such actions would have no measurable effect. LBP is not present, ACM is not present or is nonfriable and in good condition, and there are no USTs or ASTs present. A negligible impact for the action alternatives would be one where there was no impact or there are impacts to buildings with no ACM, LBP, or USTs.

Minor: Minor impacts would result from actions with relatively small impacts to human health and the environment. Minor impacts would require only slight remediation. LBP is present but intact, ACM is friable but in good condition or nonfriable and in fair to poor condition, and there are ASTs present and newly installed USTs (with leak protection), or USTs were removed with no indication of a risk of contamination. A minor impact for the action alternatives would be one that impacts one of the three areas of concern (ACM, LBP, or USTs).

Moderate: Moderate impact would result from actions causing considerable impacts to human health and the environment. LBP is present and in poor condition, ACM is friable and in poor

condition, and there is no documentation of the removal of USTs, USTs are present with no leak detection, there are old ASTs, or USTs were removed with indication of a risk of contamination (i.e., old tank removed, water in excavation). A moderate impact for the action alternatives would be one that impacts two of the three media of concern.

Major: Major impacts would result in an immediate change to the risk to human health and the environment. Known leaking USTs or ASTs are present, and/or contamination was observed during removal with no remediation. A major impact for the action alternatives would be one that impacts all three media of concern.

Effects of Alternative A (No Action)

The No Action Alternative, Alternative A, consists of no changes to the existing structures. This alternative would entail no disruption to LBP or ACM at the buildings where these hazards were identified. No other hazardous materials, including storage tanks, would be impacted under this alternative. Buildings where LBP and ACM were identified should be monitored and maintained to ensure that the materials are in good condition and intact. OSHA regulations require that operations and maintenance programs be prepared and implemented in buildings where ACM and/or LBP remain. The Operation and Maintenance Program should include, but is not limited to, awareness training, periodic surveillance, and specific repair/work methods for specific types of ACM and LBP.

In addition, a survey of all storage tanks within NPS and APVA property should be performed to ensure that all tanks are meeting current federal and state requirements, including double-walled tanks and piping, overfill alarms, and monitoring systems. The presence of USTs without proper leak detection presents a risk to the environment. Storage tanks can develop leaks at the fittings, or in the case of steel tanks, through the tank walls. Leakage of fuel from storage tanks can adversely affect a project by

requiring additional sampling, contaminated media removal, site investigation reports, and remediation costs. Leaking storage tanks also present a loss of fuel if they go unrepaired.

The No Action Alternative presents an adverse minor risk in terms of hazardous materials. Several buildings have LBP and ACM present and in poor condition and USTs present with no active leak detection system. LBP and ACM in poor condition present a risk to the human health of visitors and staff. In addition, potentially leaking USTs present a risk to the environment.

Impacts Common to the Action Alternatives

The design aspects that are common to all alternatives include the demolition of the footbridge restroom, interior renovations to the Dale House (except Alternative D), and changes to the Glasshouse parking lot.

Impacts associated with the demolition of the footbridge restrooms include the disposal of Category I non-friable ACM asphalt roofing materials, as detailed above. Mercury in light tubes and PCB in light ballasts were identified in the footbridge restrooms as well and should be disposed of in accordance with local, state, and federal regulations.

LBP was identified in the door and window casings, the wood ceilings and beams, and exterior painted surfaces at the Dale House. Proposed renovations would likely impact the LBP. Mitigation should be performed as detailed above. Lead was detected in a soil sample at the Dale House above the EPA level of concern for high contact areas, 400 ppm. Exterior renovations would be minor, so soil would remain intact.

LBP was detected in the APVA Mule Barn/ Restoration Shop on the brown interior and exterior windows and casings, brown wood door, and in the off-white exterior siding. No ACM were identified in this building. This building will remain in place so hazardous materials would not be disturbed.

Other hazardous materials (cleaning products, oil and gasoline cans, pesticides, and herbicides) were identified in several of the buildings. VHB was informed that these materials would be properly stored during renovation activities and replaced once activities are complete. Disposal of these materials has not been considered as part of this DCP/EIS. In addition, petroleum runoff from parking areas would continue, but would be collected with appropriate stormwater management facilities to protect water quality.

The redesign of the parking lot at the Glasshouse would also be performed as part of all of the alternatives. The parking lot redesign would potentially require the removal of asphalt from the existing parking lot. While asphalt is not considered a hazardous waste and can be disposed of in a landfill that accepts construction debris, the use of diesel fuel is an integral part of its installation and surficial soils may be impacted accordingly. While this is unlikely, soils should be visually and olfactorally monitored during asphalt removal.

Effects of Alternative B

Effects of Alternative B include the reconfiguration of the 1956 Visitor Center and the proposed use of the Dale House for light boxed fare service (discussed above). Two existing ticketing booths would also be demolished. ACM was identified in the floor tiles of the ticketing booths. ACM (friable and non-friable) and LBP were identified at the Visitor Center. Renovations entailing the demolition of part of the building would result in the possible disturbance of ACM and LBP. A licensed asbestos abatement contractor must remove the friable ACM prior to disturbance. The risk of LBP and ACM is generally to the restoration/demolition workers. However, workers must be trained and licensed in order to remove asbestos and lead and therefore, have the proper training on how to deal with these materials. Workers would wear the proper protection, and sampling would be conducted in accordance with local, state, and federal regulations.

A 5,000-gallon UST is located at the rear of the building and may be impacted during renovation. In addition, a UST of unknown size, associated with the James City County lift station 2-3, is located to the rear of the Visitor Center. If the UST is to remain in use, special precautions should be taken to prevent damage to the UST and to maintain adequate ventilation. If the UST is to be removed, removal should be performed as detailed above. Mercury in light tubes, PCB in light ballasts, and chlorofluorocarbons in air conditioning units were also identified in the Visitor Center. If demolition or renovation activities impact these materials, they should be disposed of in accordance with local, state, and federal regulations as described above.

As part of Alternative B, the parking lot would be redesigned and would require the removal of asphalt. As described above, asphalt can be disposed of as construction debris. However, surficial soils may be impacted due to the use of diesel fuel during its manufacturing and installation. Soils should be monitored to ensure no contamination exists.

Alternative B also includes the proposed construction of an addition onto the Jamestown Rediscovery™ Center. This addition may impact LBP and ACM, depending on its location. LBP was identified primarily on interior features but also on original siding, the sun porch, and the front porch. ACM was identified only in the HVAC insulation mastic. Disposal or handling of ACM and LBP should be performed as detailed above.

Construction of an Intermodal Transportation Terminal with associated parking at Neck of Land is also proposed as part of this alternative and may impact OHM. Two locations containing possible USTs were identified at an old house site and former gas station. Buried metal debris was determined to be extensive in the former gas station area. The metal debris should be identified and properly managed off-site. Additional investigation should be performed to confirm the existence of USTs and to identify the debris present. UST disposal and soil sampling, if required, should be performed as detailed above.

Alternative B would result in a moderate impact (LBP and ACM) at the Visitor Center and Dale House. However, all other buildings would suffer minor or negligible impacts or would not be impacted at all. The overall impact of Alternative B would therefore be minor.

Effects of Alternative C

As in Alternative B, Alternative C includes the proposed renovation of the Visitor Center and the conversion of the Dale House to serve food. Impacts related to these facilities are detailed above under Alternative B.

Alternative C includes the reduction of the Island parking lot and would require the removal of asphalt. See Alternative B for a discussion of the impacts of asphalt removal.

Alternative C also includes proposed construction of a new Visitor Center, NPS collections and research facility, and Intermodal Transportation Terminal with associated parking at Neck of Land. As discussed in Alternative B, this facility may impact possible USTs and buried metal debris identified in the area. Additional investigation would be required to confirm the presence or absence of the USTs and to determine the origin of the metal debris discovered. Mitigation, if required, should be performed as detailed above.

As in Alternative B, Alternative C would result in a moderate impact at the Visitor Center and Dale House. All other impacts would be negligible or minor, resulting in an overall minor impact for Alternative C.

Effects of Alternative D

Alternative D involves the proposed expansion and renovation of the existing Visitor Center. Impacts related to LBP, ACM, and OHM for this facility are described above under Alternative B.

LBP was identified in the white painted lift station at the rear of the Visitor Center. If impacts occur to this

structure, mitigation should be performed such that LBP is removed prior to the occurrence of dust causing activities as detailed above.

Moderate impacts would occur at the Visitor Center, while all other impacts would be either minor or negligible.

Effects of Alternative E

Proposed renovation of the Visitor Center is also part of Alternative E. Impacts related to this structure are described above under “Effects of Alternative B.” Alternative E also involves the possible conversion of the Dale House to a lounge for volunteers and donors. This conversion would require minor renovations to the building. Impacts to this structure are detailed above under “Impacts Common to the Action Alternatives.” As in Alternative B, two existing ticketing booths would be demolished.

As part of Alternative E, an Intermodal Transportation Terminal with associated parking is proposed on Neck of Land. Parking associated with this facility would likely impact the area where possible USTs were identified. Additional investigation is required to confirm the presence of the USTs and to determine the origin of the metal debris discovered.

Impacts under Alternative E are very similar to Alternative B. The overall impact of Alternative E is minor.

Cumulative Impacts

Cumulative impacts to hazardous materials could result from other actions within Colonial NHP (new projects or maintenance operations) or development at the Jamestown Settlement. For Colonial NHP, impacts to hazardous materials could be minimized through careful maintenance procedures and appropriate storage of hazardous materials. Overall, the minor impacts of the Jamestown Project would not contribute significantly to cumulative impacts to hazardous materials within the area.

Conclusion

Table 4-17 provides a list of structures and sites containing hazardous materials that would be potentially impacted by the alternatives. Although all alternatives, with the exception of the No Action Alternative, require some impacts to hazardous materials, those impacts are easily mitigated. Trained personnel would perform the removal,

packaging, transportation, and disposal of hazardous or regulated material. These personnel would wear the appropriate personal protective equipment and would ensure that the levels of airborne or residual contamination were at acceptable levels.

Table 4-17: Summary of Impacts to Hazardous Materials/Contamination					
	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Existing Visitor Center	Minor	Major	Major	Major	Major
Footbridge Restrooms	Negligible to Minor	Minor	Minor	Minor	Minor
Harrington House	Moderate	Negligible	Negligible	Negligible	Negligible
NPS Ranger Entrance Station	Negligible	Negligible	Negligible	Negligible	Negligible
NPS Ranger Entrance Booths	Negligible	Minor	Negligible	Negligible	Minor
Yardley House/Jamestown Rediscovery™ Center	Moderate	Minor	Negligible	Negligible	Negligible
APVA Mule Barn/Restoration Shop	Minor	Minor	Minor	Minor	Minor
Dale House	Negligible to Minor	Moderate	Moderate	Minor	Moderate
Proposed Neck of Land Facilities	Minor	Minor	Minor	Negligible	Minor
Buried Munitions	Negligible	Negligible	Negligible	Negligible	Negligible
Old Pottery Studio	Negligible	Negligible	Negligible	Negligible	Negligible
Overall Impact	Minor	Minor	Minor	Minor	Minor

4.3.3 Impacts to Socioeconomic Resources

4.3.3.1 Land Use and Zoning

This section considers the impacts of each of the alternatives on land use, in both the Jamestown Project site and areas contiguous to the Jamestown Project site. The Jamestown Project site includes Jamestown Island, Glasshouse Point, Neck of Land, Powhatan Creek Overlook, and the Colonial Parkway from Neck of Land to the Jamestown Island parking lot.

The project boundary setting includes land uses in the immediate vicinity and views to adjacent lands that may have an effect on the Jamestown Project site’s scenic qualities. Not only are impacts from land use changes considered in this section but also impacts from park actions to adjacent lands and development patterns in the vicinity of the Jamestown Project.

Methodology

All available information on land use was compiled. This information included land use adjacent to and within the Jamestown Project site. The major sources of information included the *James City County Land Use Plan* (James City County 1997) and the draft *Cultural Landscape Report* (OCULUS 2002). Predictions about land use impact were based on actions at Jamestown and measurable shifts in development and growth patterns in James City County. Intensity of effects is defined as follows:

Negligible: An action that would have no measurable effect on land uses within the project area or the surrounding affected environment. Actions with negligible impacts could affect small land use sectors, but these impacts would not be readily perceptible as resulting from actions at Jamestown.

Minor: An action that would affect certain land use elements in measurable but insignificant ways. An example would be an insignificant increase in commercial development in the area, or minor development at an existing site in the project area that experiences current use.

Moderate: An action that would cause clearly measurable shifts in development and growth patterns in James City County but not such that substantially alters land use planning. This also includes the action of new development at the project site that expands the use of the site.

Major: An action that would result in substantial land use changes necessitating re-evaluation of local planning policies. This also includes actions causing a major shift in activities centered on the Island, thus necessitating large-scale land conversion.

Effects of Alternative A (No Action)

James City County, in its 1997 *Comprehensive Plan – Toward 2007*, designated Jamestown Island to Neck of Land and all of the Colonial Parkway as *Park, Public, or Semi-Public* open space. This designation would not

change as “these areas serve as buffers to historic sites, as educational resources, and as areas for public recreation and enjoyment.” The county has also recommended the area in and around Jamestown for a “high level of protection in order to preserve and enhance the integrity of the National Historic Site and its context.” The development standards to protect its special qualities would not change under the No Action Alternative.

The APVA and NPS, in continuing current management practices would not change the existing land use of Jamestown Island or the entire Jamestown Project area. Likewise, James City County would not change the land use designations or zoning of this historic area. The 2007 anniversary event and associated activities are not anticipated to impact land use or zoning in the project area, even as prudent management and operations policies would be employed. If proposed development on adjacent land use is seen to threaten the quality of Jamestown, provisions for land acquisition or buffer zone easements would be proposed by the APVA/NPS.

Development and growth trends in the surrounding areas of James City County and Surry County (across the James River from Jamestown Island) would continue independent of the No Action Alternative or any of the action alternatives. In all scenarios, the APVA/NPS would collaborate with local jurisdictions to preserve the existing character of the Jamestown Project area.

The APVA/NPS would monitor proposals for lands adjacent to the Jamestown Project site and land across the James River from Jamestown Island, attend local planning meetings where necessary, and provide input on county planning and development initiatives that potentially affect the Jamestown Project area and its resources.

In the No Action Alternative as well as the action alternatives, the land adjacent to the project site that is occupied by the Jamestown Settlement would

continue to experience major facilities development, with anticipated increases in visitor numbers. The APVA and NPS would remain diligent in monitoring the proposed plans for the Jamestown Settlement. Also, the plan for the new alignment of Route 359 directly impacts the Jamestown Project area and would greatly enhance not only the existing visual character of the project site, but visitor access to Jamestown.

Impacts Common to the Action Alternatives

New and expanded visitor services and interpretation at Jamestown Island are proposed in all alternatives. Existing land uses at Jamestown include cemetery, interpretive, undeveloped open space, recreational open space, and wildlife management. The remainder of the Island is undeveloped forest and wetlands.

Loop Drive

The Loop Drive provides the means to access many of these land uses. All the action alternatives plan change to the interpretive content of the signage on the Loop Drive. There would be negligible impacts on land use from this proposal.

Proposed Footbridge from Observation Building to Island Parking Lot

This pedestrian walkway would have a negligible impact on existing land use of the Island. It would be constructed over the Pitch and Tar Swamp, but would not change the land use on the Island.

Proposed Walkway Transition (Hub) on the Historic Site

There would be no impact on land use from this proposed action.

Proposed Interpretive Anchor East, Agricultural Exhibit Area

There would be a minor impact on the land use of the Island due to this new interpretive exhibit. The current open space would change with the construction of the exhibit. However, the character of the Agricultural exhibit would be designed to

mimic natural features, keep structural construction at a bare minimum, and have agricultural activity so as not to be a blemish on the landscape. A small structure is proposed to dispense liquid refreshment to the visitor as they experience this end of the Townsite.

Proposed Comfort Facility at Agricultural Exhibit

A public restroom is proposed adjacent to the Agricultural exhibit area. This action would be a minor impact on the current open space land use. The restrooms are there, however, to accommodate visitor comfort, safety, and satisfaction.

Proposed Interpretive Anchor West, the Ludwell Exhibit Facility

All the alternatives propose an exhibition facility and experimental archaeology at the Ludwell site on the east end of the Townsite. Existing open space that would be the site of the proposed exhibit facility would become land use supporting visitor services and interpretation. This change constitutes a moderate impact on the land use of the Ludwell site.

Improvement of Glasshouse Point Parking Lot

The land use at Glasshouse Point remains the same, as each alternative modifies only the existing parking lot. The modifications are to better accommodate design requirements for bus and parking. This would be a negligible impact to the existing land use.

Separate Hike/Bike Path from Glasshouse Point Parking Lot to Jamestown Settlement

This hike/bike path would have a minor impact on the land use at Glasshouse Point. The currently wooded land would be changed to accommodate a path; however, new plantings would be installed to mitigate the construction and further screen the path from the Colonial Parkway.

Additional Changes

New and expanded visitor services and interpretation that are common to all alternatives and the resulting increases in visitation may

directly impact land use on Route 31, Jamestown Road. These changes might include commercial and retail development. In this case, the APVA and NPS would collaborate with James City County and monitor any proposed changes. Should any of these changes pose a threat to quality of Jamestown Island, NPS/APVA would seek ways for providing visual quality buffer easements or land acquisition.

Effects of Alternative B

Intermodal Transportation Terminal at Neck of Land

There would be a moderate impact to the existing land use at Neck of Land by the proposed building and parking facility. The land use on Neck of Land would change from forested vegetation and open space to a building and parking facility. This land use change would present visual issues that are addressed in detail in the “Impacts to Visual Quality and Aesthetics” section (Section 4.3.2.10) of this document. Creative and innovative design and construction techniques and use of materials as well as extensive landscape design would mitigate the visual change in land use but not the physical change.

Hike/Bike Path on Neck of Land

A hike/bike path would use the existing road trace on Neck of Land to connect to Jamestown Island. Land use change would come with construction of a marsh boardwalk and bridge over Back River to support visitor services and new interpretive opportunities. This would represent a change in present day land use, but would recreate the land use that existed in the 1940s and 1950s by reintroducing a transportation corridor to the Island. The boardwalk would have a minor impact on the existing land use designated as wetland. It would be designed and constructed to minimize impacts to wetlands and Back River.

Replacement Visitor Center and Educational Facility

The replacement Visitor Center and educational facility would be located in the existing Island parking lot. The parking lot is considered a terminus of the Colonial Parkway and part of the National Historic Register designation. The location of the replacement Visitor Center would change the configuration of part of the parking lot and the existing land use to accommodate a building in support of visitor services. Although this change would constitute a moderate impact on the land use as it exists, it would provide comfort, orientation, exhibits, classrooms, retail, and food for the visitor; accommodations that have been a constant visitor request since 1960.

Observation Building

The proposed Observation Building would be sited in an existing land use that currently accommodates a variety of visitor services. That land use would remain, as the proposed Observation Building would accommodate exhibits, interpretation, and landscape views of historic Jamestown. This action would have a negligible impact on the current land use. In addition, the visual impact of the land use on the historic site would be lessened.

Expanded Jamestown Rediscovery™ Center

The Jamestown Rediscovery™ Center would be expanded in this alternative to jointly house the APVA/NPS artifact collection and research facility. Open space/parking to the north and west of this existing facility would change to accommodate expansion and support activities of research, curation, and storage of joint collections. This action would have a moderate impact on the existing land use at the Jamestown Rediscovery™ Center. The proposed expansion would be designed and constructed in character with the existing building and the landscape and would emphasize outdoor space and relationships to the new building.

Dale House

In Alternative B, the Dale House would change in designation from museum and administrative to food service. This change in land use would require a zoning change or special permit from James City County. This action would be a minor impact on the existing land use. The interior renovation would not affect the visual character of the building or the site. The circulation and seating around the Dale House would be planned, in contrast to the haphazard placement of benches and paths as they now exist.

Effects of Alternative C

Replacement Visitor Center, Intermodal Transportation Terminal, Collections Facility, and Parking at Neck of Land

Similar to Alternative B, this alternative proposes visitor facilities and parking at Neck of Land. In Alternative C, however, the facilities would include the new Visitor Center, Intermodal Transportation Terminal, and the NPS artifacts collection and research facility. In addition there would be additional parking for 300 cars and 20 buses. The extent of this development on Neck of Land would constitute a major impact on the existing land use adjacent to the Parkway. There would also be visual impacts, which are addressed in detail in the “Visual Quality and Aesthetics” section (Section 4.3.2.10) of this document. The land use on Neck of Land would change from forested vegetation and open space to a large building and parking facility. Creative and innovative design and construction techniques and use of materials, as well as extensive landscape design, would mitigate the visual change in land use. Landscape screening and vegetative buffers would not fully screen this land use due to the size of the facility and parking.

Ticketing and Information Facility in the Island Parking Lot

The small ticketing/information facility and bus drop-off would change the existing land use to visitor facility and support. Vehicular traffic would park at Neck of Land and use alternative methods of

transport to the Island. The “historic Island parking lot” would then become a place for modal transfers, free of parked cars and vehicular traffic and an area for pedestrian use. This action would be a moderate impact on the existing Jamestown Island parking lot.

Observation Building

This negligible impact would be the same as described for Alternative B.

Dale House

This action would be same as described for Alternative B, and the impact would be minor.

Effects of Alternative D

Renovated Visitor Center, Observation Building, Collections Facility

The renovated Visitor Center/NPS collections and research facility/Observation Building would be located on the site of an existing land use currently accommodating a variety of visitor services. That land use would remain unchanged; therefore this action would have a minor impact on existing land use. There would, however, be visual issues due to the scale of this facility (see Section 4.3.2.10).

Effects of Alternative E

Intermodal Transportation Terminal and Parking Facility at Neck of Land

This action would be same as described under Alternative B, resulting in a moderate impact to land use at Neck of Land.

Hike/Bike Path

The hike/bike path in Alternative E would change the existing land use of Neck of Land as a wetland boardwalk is proposed as well as a hike/bicycle bridge over Powhatan Creek. The boardwalk would represent visitor support and recreational use added to the wetland. This action would be a minor impact to the existing land use. The boardwalk would be designed and constructed to minimize impact to the wetland and Powhatan Creek.

Replacement Visitor Center and Educational Facility

As in Alternative B, Alternative E also proposes a replacement Visitor Center and educational facility in the existing Island parking lot; therefore, impacts would be the same as described under Alternative B.

Observation Building

This negligible impact would be the same as described for Alternative B.

Dale House

In Alternative E, the Dale House would change in designation from museum and administrative to donor and volunteer lounge. This is a change in interior use of the Dale House but may require zoning change or special permit from James City County. This action would be a minor impact on the existing land use. This interior renovation would not affect the visual character of the building or the site.

Cumulative Impacts

As currently known, there are no cumulative impacts that would necessitate re-evaluation of local planning policies or cause large-scale land conversion in multiple places. Change in land use on properties adjacent to the project boundary and across the James River in Surry County would have direct impacts on any of the action alternatives for Jamestown, as views to Surry County are an integral part of the experience of the Jamestown Project area. Any new development along the Surry County shoreline would directly impact the visitor experience to the Island. This is documented in the “Visual Quality and Aesthetics” section (Section 4.3.2.10) of this document.

Expanded residential development along the Colonial Parkway would directly impact adjacent land uses to the Colonial Parkway and the visitor experience in accessing Jamestown Island, especially in the fall and winter months when the leaves have fallen. Existing residential development at Pages’ Landing is very visible from the Parkway during these months. Additionally, the Jamestown Marina development is a land use that has a direct visual

impact on all visitors using the Colonial Parkway. Any changes at the Marina could affect the abutting land use character of the Parkway. The APVA and NPS are presently in discussions with the landowner to try to improve the visual character of the existing marina and recommend future development ideas that would be in keeping with APVA and NPS visual needs. See “Section 4.3.2.10: Visual Quality and Aesthetics” for a more thorough discussion of the direct visual impacts of this land use.

The changing development and land use at Jamestown Settlement also would directly impact any of the action alternatives. As in Alternative A, the No Action Alternative, the APVA and NPS would remain diligent in monitoring the proposed plans for the Jamestown Settlement to ensure compliance with local land use and environmental codes.

Land use changes to property adjacent to the project boundaries could occur independent of any of the proposed actions, and so the APVA/NPS would diligently monitor proposed land use/zoning changes that could affect the project site. The impacts from land use changes in Surry County and James City County could greatly affect the visitor experience at Jamestown Island and the existing visual character and uniqueness inherent with the Jamestown Project area.

Conclusion

Within the Jamestown Project site, there would be no impacts that would necessitate re-evaluation of local planning policies or cause large-scale land conversion in multiple places. In Alternative B, C, and E, there are more designated changes in land use within the project boundary than in Alternative D. Of the action alternatives, Alternative D would have the least impacts on land use, and Alternative C would have the most major impacts, primarily due to the large land use change at Neck of Land to accommodate a large facility and parking. All proposed changes in land use would accommodate visitor services and support, as well as new and better opportunities for interpretation.

4.3.3.2 Regional and Local Economy

This section considers the impacts of each of the alternatives on social and economic resources at a local and regional level. Within Jamestown itself, impacts to APVA/NPS expenditures, visitor spending, tax revenues, and effects on in-house vendors are discussed.

Currently, approximately 380,000 people visit Jamestown Island per year. With planned improvements, this number is expected to increase to between 550,000 and 750,000 visitors annually by 2020. Lengths of stay estimates assume that visitors would spend some time at every exhibit and stop for refreshments, where available.

Methodology

The socioeconomic analysis included herein used the best available data from a variety of sources. These included local comprehensive plans, U.S. Census Bureau statistics, and information from the Virginia Travel Commission and the Virginia Employment Commission. Historical data describing visitation and visitor spending were also analyzed. Based on this information, socioeconomic projections were made based on trends and an assessment of likely increases in visitation as 2007 approaches. These projections allowed the study team to assess the effects of the various alternatives on the regional and local economy, including the intensity of those effects, as follows. It should be noted that impacts in this context could be beneficial or adverse.

Negligible: An action that would have a very small impact on the regional and local economy. The results of such actions would have no measurable effect on the socioeconomic environment.

Minor: Minor impacts would result from actions with relatively small effects. The action would affect only a small sector of the economy and would require significant effort to measure. The consequences of such actions would not be readily apparent.

Moderate: An action that would measurably impact a relatively small sector of the socioeconomic environment or would alter the relationship between sectors of the economy. Adverse impacts would not prove significant enough to threaten any economic sector, and beneficial impacts would not result in major structural shifts.

Major: Major impacts to the regional and local economy would become readily apparent in the form of beneficial or adverse shifts in the socioeconomic structure. In certain cases, entirely new economic sectors would be created or established sectors eliminated. Major impacts would reverberate throughout the socioeconomic environment, significantly altering existing conditions, in beneficial or adverse ways.

Effects of Alternative A (No Action)

Local/Regional Economy

Under the No Action Alternative, there would be no additional expenditures by the APVA or NPS for construction, employee salaries, or other improvements. Visitor spending would remain at current levels in normal years, and there would be no related increase in visitor spending or tax revenues for the local and regional economy. Neighboring James City and Surry counties can expect current levels of visitor related traffic and spending to continue with normal yearly increases. The No Action Alternative would have negligible impacts.

Visitation

Visitation at nearby Jamestown Settlement is expected to double in response to improvements, including a new Education Building, Welcome Café, and monument area, as well as increased parking and rerouted traffic, in preparation for the 2007 commemoration. Jamestown Island can expect some increased visitation as a result of overflow from the Settlement. By 2020, visitation at Jamestown Island is expected to reach 552,180, and the average visit is estimated at 94 minutes. This would be a negligible impact.

Collections

In total, APVA and NPS house one million artifacts on Jamestown Island. The APVA portion of the Jamestown Collection is kept in the Jamestown Rediscovery™ Center. The building itself is located within the 500-year flood zone; however, the collections are stored on an elevated floor to protect the valuable artifacts from water damage. The NPS portion of the Jamestown Collection, on the other hand, is located in the basement of the existing Visitor Center, within the 500-year flood zone. The collections are therefore at risk of damage from floodwaters. The No Action Alternative would not directly affect the collections; however, Alternative A would have a major adverse indirect effect of the collections were damaged or lost.

Refreshments/The Carrot Tree

Short visitation times can be partly attributed to a lack of refreshments at Jamestown Island. Until April 2001, no refreshments were available on the Island, and visitors were forced to leave the park to get food and drink. Recently, the APVA entered into a cooperative agreement with a local bakery (The Carrot Tree) to provide sandwiches, baked goods, and beverages on the Island. This has been a beneficial impact to the visitor experience at Jamestown and has been an economical success for The Carrot Tree. Alternative A would not change this arrangement, so the impact would be negligible.

Eastern National

The production and sales of the glassmaking demonstration at the Glasshouse are contracted out to Eastern National. In 2000, Eastern National's total profits were \$1.5 million. Of this, \$80,000 to \$90,000 was donated back to Jamestown. Increases in visitation, perhaps as a result of overflow from Jamestown Settlement, would surely lead to increases in sales at the Glasshouse and more income for Eastern National and the APVA and NPS. This alternative would have a negligible impact on the economic success of Eastern National.

Boat Service/Jamestown Explorer

Currently, the Jamestown Explorer, a privately run boat, provides 1-1½ hour narrated nature and history tours of Powhatan Creek, Back River, and Jamestown Island. Alternative A would not change this relationship so the impact would be negligible.

Impacts Common to the Action Alternatives

Local/Regional Economy

New and expanded visitor services and interpretation at Jamestown Island are proposed in all alternatives. One-time construction costs; long-term maintenance, research and staffing expenditures; and visitor expenditures in the local community would contribute sales and income tax revenues and tourism-related jobs to the local and regional economy.

Improvements in each of the alternatives would require local contract and construction work. This would provide short-term benefits to the local and regional economies by generating revenues in the community for construction labor and supplies. The regional economy would see minor benefits in the form of tax revenues from income (6.0% for corporations) and sales tax (4.5% state base rate) on construction-related materials. Maintenance and utility expenditures would also contribute to the long-term local/regional economy.

Increases in visitation are expected in all alternatives, resulting in greater numbers of people spending time and money in both James City County and Surry County.

Visitation

Improvements at Jamestown Island are expected to increase visitor numbers and average lengths of stay to the area. This would have long-term, minor benefits to the local/regional community in terms of additional sales tax and revenues from more people using local businesses, hotels, and restaurants (4.5% base tax and 4.0% James City County meal tax).

Visitation is expected to increase to between 634,840 (Alternative D) and 749,800 (Alternatives B and C) visitors annually by 2020. Generally, each action alternative includes greater interpretation, recreation options, and hands-on activities, which would ultimately draw more visitors, bringing more business to the park and to the region.

Increased visitation to Jamestown could strain the current small staff, perhaps necessitating the hiring of new staff, an additional cost for the NPS and possibly the APVA. "Section 4.6: Impacts to Operations" discusses these impacts in more detail.

Collections

In all alternatives, the APVA portion of the Jamestown collection remains in the Jamestown Rediscovery™ Center on an elevated floor above the level of a 500-year flood. The location of the NPS portion varies for each alternative, as discussed below.

Refreshments

Longer visits to Jamestown Island would require the availability of onsite refreshments; all alternatives, therefore, make some provision for providing food and drink to visitors. This would be a minor beneficial impact to either vendors or concessionaires.

Effects of Alternative B

Local/Regional Economy

Alternative B calls for construction at several areas of the park. This would increase park expenditures, while generating revenues in the local community for construction labor and supplies. Costs for this alternative are estimated at \$43,552,562.

James City County would host many of the visitors to Jamestown. Surry County and businesses there would see increased visitation, and the number of cars using the ferry to cross the James would increase. This alternative would have major short-term and moderate long-term benefits.

Visitation

A new Intermodal Transportation Terminal at Neck of Land is expected to attract visitors traveling along the Parkway and ease confusion with Jamestown Settlement for visitors entering the park from the Colonial Parkway.

Restrooms, in addition to concessions, provided at many locations throughout the Island would contribute to visitor comfort and increased average length of visit. Visitor numbers are also expected to increase to 749,800 by 2020 in response to improved amenities and interpretation of the history of the area, thereby bringing more money to the APVA/NPS and the region.

A hike/bike trail would be added with several points of entry and a bridge over Back River, and interpretive anchors would be constructed in the far eastern and western portions of the Island. Improved trails for bikers would attract recreation groups to the facility, and bicycle rentals would be available within the site for less serious cyclists. A small shuttle bus with audio interpretation would provide tours along the Loop Drive. These improvements would spread visitors throughout the site and into areas that are currently unused, such as the eastern end of the Townsite, and provide more activities in which visitors can participate, extending the length of many visits. Interpretive planners estimate the total length of stay under Alternative B to average 3.8 hours. Alternative B would moderately impact visitation, resulting in long-term increased numbers.

Collections

The Jamestown Rediscovery™ Center would be expanded to house the NPS portion of the Jamestown collection in addition to the APVA portion, although the collections would be housed in a separate area of the building. This alternative would have major permanent beneficial impacts to the curation, display, and protection of the collections.

Refreshments/The Carrot Tree

Refreshments, in the form of vending machines and light fare boxed food (sandwiches, salads, and pre-prepared entrees), would be provided at several locations and would contribute to increased visitor spending within Jamestown. Refreshment provisions would most likely be contracted to private vendors, increasing revenues for the local and regional economy. The new Intermodal Transportation Terminal at Neck of Land would contain vending machines, and the Visitor Center and Dale House would have food and drink. Drinks would also be available at the new Agricultural exhibit site.

Currently, a local bakery, The Carrot Tree, operates a refreshment stand in cooperation with the APVA from a temporary facility near the Dale House. Prior to the onset of this agreement in April 2001, there were no refreshments offered on Jamestown Island, and visitors to the park would leave to buy food and beverages. The APVA and NPS could choose to continue using this vendor under the present terms, expand the use of this vendor, or switch to a different vendor. The owners of the Carrot Tree note that since the opening of the Jamestown Island site there has been a noticeable decline in the number of patrons at the original store location on Jamestown Road, 3 miles from the Island; however, overall business has increased. NPS policy and new concessions law requires that the NPS verify that any new, potential concessionaire has a "reasonable opportunity to make a profit." Alternative B would have moderate long-term benefits or major long-term adverse impacts, depending on whether or not The Carrot Tree was the chosen vendor.

Eastern National

Eastern National's Glasshouse operation would benefit from increases in visitor numbers and lengths of stay. In turn, Colonial NHP would receive a greater donation through the cooperative agreement. This alternative would have moderate long-term benefits.

Boat Service/Jamestown Explorer

In this alternative, the APVA and NPS plan to sponsor their own boat, contracted to a vendor, which would provide tours of Powhatan Creek and Back River and the associated marsh, as well as serve as a mode of transport between the areas of Glasshouse Point, Jamestown Island, and Neck of Land. This could lead to decreased business for the Jamestown Explorer. There is also the possibility that the APVA and/or NPS and the Jamestown Explorer would enter into a cooperative agreement, whereby the APVA and/or NPS would use the Explorer in lieu of contracting boat operations to a third party unidentified at this time. Impacts to the Jamestown Explorer or any other concessionaire would be long-term and could be beneficial or adverse depending on the contractual agreement.

Effects of Alternative C

Local/Regional Economy

As in Alternative B, this plan calls for construction throughout the project site: a new Visitor Center/NPS collections and research facility/Intermodal Transportation Terminal at Neck of Land, increased concessions and restrooms, construction of a hike/bike trail, and improved interpretation of the historic resources at Jamestown. Costs associated with this alternative are estimated at \$40,646,665.

James City and Surry counties can expect to see increased numbers of visitors staying, eating, and recreating. Major short-term and moderate long-term benefits would occur under this alternative, as discussed under Alternative B.

Visitation

These changes would have a beneficial impact on visitation in terms of overall visitor numbers and satisfaction, as well as spending both at Jamestown and in the community and subsequent tax revenues. Visitation is predicted to increase to 749,800 visitors by the year 2020.

Interpretive anchors at both ends of the Townsite and a small shuttle bus with audio interpretation on Loop Drive would boost visitor traffic, especially in the northern and eastern regions of the Island. Average length of stay at the site is expected to be approximately 3.6 hours. Alternative C would moderately impact visitation, resulting in long-term increased numbers.

Collections

NPS collections would be contained at a new facility located at Neck of Land, out of the 500-year flood zone, thus eliminating potential costs associated with loss of valuable collections. In this respect, Alternative C would result in a major permanent beneficial impact to the collections.

Refreshments/The Carrot Tree

Light fare boxed food would be provided at the renovated Dale House and at Neck of Land. As, in Alternative B, this could have adverse or beneficial impacts to both existing Carrot Tree operations, on the Island and on Jamestown Road, depending on what vendor is chosen. Additionally, drinks would be available at the new Agricultural exhibit site. Alternative C would have a moderate, long-term, beneficial or adverse impact, depending on the contract.

Eastern National

Increased numbers of visitors would spend more time and money at the Glasshouse store, benefiting both Eastern National and the APVA/NPS. Impacts to Eastern National would be the same as those under Alternative B.

Boat Service/Jamestown Explorer

Alternative C also provides for a boat service associated with the APVA/NPS, which could have an adverse impact on the Jamestown Explorer, depending on the concessionaire chosen for this service. Impacts would be the same as those identified under Alternative B.

Effects of Alternative D

Local/Regional Economy

Alternative D adds fewer amenities than the other action alternatives: estimated costs are \$32,770,699.

James City and Surry counties can expect increased revenues from more people visiting the area and exploring the surrounding communities. Alternative D would result in major short-term and moderate long-term beneficial impacts to the local and regional economy.

Visitation

Restrooms and refreshments are added at the new interpretive anchors within the Townsite, and minor improvements are made to interpretation of historic resources. This alternative offers the fewest additional incentives to visitors and would probably lead to the least amount of change in terms of visitor numbers, expected to increase to 634,840, and spending. Length of stay is projected to average approximately 2.9 hours. The interpretive anchors and a small shuttle along Loop Drive would spread visitors along that axis, but no parking, buildings, or other facilities would be located at Neck of Land or in the northern portions of the Island. Under Alternative D, impacts to visitation would be moderate, beneficial, and long-term.

Collections

NPS collections would remain in their present location in the Visitor Center, but would be moved to a higher floor out of the flood zone. Alternative D would have a major, permanent, beneficial impact on the collections.

Refreshments/The Carrot Tree

Alternative D makes no provisions for light fare at the Dale House so The Carrot Tree would remain in business at the Jamestown Island location. Refreshments would also be available at the Visitor Center building, and drinks would be provided at the Agricultural site. Impacts to the concessionaire would be negligible under this alternative.

Eastern National

Increases in visitation, although smaller than in other alternatives, would benefit both Eastern National and Colonial NHP through increased business at the Glasshouse. Impacts to Eastern National would be minor, long-term, and beneficial.

Boat Service/Jamestown Explorer

There are no plans in Alternative D for new boat docks or a boat service. The Jamestown Explorer would be free to continue its current tour without competition. Due to increased visitation and area traffic, the Explorer would experience minor, long-term, beneficial impacts.

Effects of Alternative E

Local and Regional Economy

Alternative E offers similar visitor amenities, services, and facilities as Alternative B; therefore, economic impacts would be similar as well. Alternative E provides visitors on the Colonial Parkway an Intermodal Transportation Terminal at Neck of Land. There would also be a hike/bike trail through Neck of Land and across Powhatan Creek. Alternative E would result in major, short-term and moderate, long-term, beneficial impacts to the local and regional economy. Overall costs related to this alternative are estimated at \$40,577,877.

Visitation

Overall, visitation is expected to increase to 661,270 visitors by 2020. Visitation would increase in the eastern and western regions of the project site with the addition of interpretive anchors and a small shuttle bus on Loop Drive. Additional restrooms would be provided at the interpretive anchors, and a lounge for volunteers and donors would be constructed in the Dale House. The hike/bike trail and improved interpretation should attract more visitors to Jamestown and extend the average length of stay, increasing revenues to the APVA and NPS. The average length of stay is expected to be approximately 3.6 hours.

Collections

The NPS portion of the Jamestown collection would be moved to a remote location in the James City County/City of Williamsburg area, out of the flood zone. This would have a major, permanent, beneficial impact on the collections.

Refreshments/The Carrot Tree

Vending machines would be available at the Intermodal Transportation Terminal at Neck of Land, and refreshments would be served at the Visitor Center. Drinks would also be provided at the Agricultural site. Additionally, there would be a lounge for volunteers and donors at the renovated Dale House. The Carrot Tree would continue as a temporary vendor, so they would experience moderate, long-term beneficial impacts.

Eastern National

Visitation projections for Alternative E expect 661,270 visitors to Jamestown in the year 2020. This increase in visitation would result in increases in business at the Glasshouse store and increased income for Eastern National and NPS. Under this alternative, impacts to Eastern National would be moderate, long-term, and beneficial.

Boat Service/Jamestown Explorer

Boat docks would be constructed at Neck of Land and the Townsite, and boat transport would be provided between these sites by an APVA/NPS contracted concessionaire. If the Jamestown Explorer provides this service, impacts would be minor, long-term, and beneficial. However, if another concessionaire provides the service, then impacts to the Explorer would be minor, long-term, and adverse.

Cumulative Impacts

Additional factors that would contribute to cumulative impacts to regional and local economy would include increased development in the area and the approach of the 400th anniversary commemoration in 2007. These would have moderate, beneficial impacts on the local and regional economy when considered along with the Jamestown Project impacts.

Conclusion

Alternative B would have the most costs associated with construction; however, the added benefits of the improvements are expected to significantly increase visitor satisfaction and stay at Jamestown, as well as visitor spending within the site and the community. Other alternatives would have fewer costs but offer fewer amenities and thus produce fewer beneficial impacts to the local and regional economy.

Protection of the priceless Jamestown collection has been a priority in development of the action alternatives. Alternative E would remove the NPS portion to a yet-to-be-determined, offsite, upland location, while the other alternatives would keep the artifacts at Jamestown but above the 500-year flood elevation by moving the collections to higher floors (Alternatives B and D) or to Neck of Land (Alternative C).

Each alternative would offer the potential for cooperative agreements with Eastern National, The Carrot Tree, and the Jamestown Explorer to continue and expand concessionary and interpretive services. However, the APVA and NPS could also choose to contract with new vendors, adversely impacting business at each of these. Alternative D, however, has no provisions for an interpretive boat tour. In this case, the Jamestown Explorer would remain in its current state.

4.3.3.3 Emergency Services

Emergency services for Jamestown Island and the surrounding areas are provided by a number of sources, including the NPS law enforcement park rangers, James City County emergency services, and the Williamsburg Community Hospital.

Methodology

The best available data was obtained directly from each of these providers, as well as from other sources such as the *James City County Comprehensive Plan*. Current demands on these services were assessed based on existing levels of population and

tourist visitation. Projected visitation levels were then used to estimate potential impacts of the various alternatives on emergency services. The intensity of those impacts can be described as follows:

Negligible: An action that would have no measurable impact to emergency services.

Minor: Actions that would affect emergency services in a way that would prove extremely difficult to measure. To the normal observer, such impacts would not be apparent.

Moderate: Actions that would measurably affect the emergency services system. Such impacts could increase demands on a limited number of emergency response facilities, require additional emergency staff for NPS, or require moderate staffing and priority adjustments throughout the system.

Major: Major impacts would significantly affect the entire emergency services system. Actions with major impacts could necessitate construction of additional facilities or could require significant staffing increases and/or infrastructure expansions at existing facilities.

Effects of Alternative A (No Action)

The No Action Alternative would have negligible impacts to emergency services. No change in the current use of local emergency services would be expected. The existing fire hydrant at the Glasshouse is located approximately 600 feet from the facility; this is a substantial distance that may hinder fire-fighting capability.

Impacts Common to the Action Alternatives

Increases in visitation would be expected to result from each of the action alternatives, thus increasing the probability that emergency services would be required at Jamestown. The NPS would likely need to increase the number of law enforcement park rangers that it employs, and local and state police

service could see an increase in calls from the site. This would have the greatest impact on the local law enforcement center on John Tyler Highway because of its close proximity to Jamestown.

A similar increase in the need for emergency fire services could be expected. To assist with this, a new fire hydrant would be put in place to protect the Glasshouse, Jamestown Rediscovery™ Center, Godspeed Cottage, and Dale House. In addition, new water service to new buildings and improved service for fire fighting water throughout Jamestown Island would be a common element of all the alternatives.

Emergency response plans created by the APVA and NPS and appropriate training for NPS park rangers would help to reduce the strain on outside emergency service personnel.

Under all action alternatives, moderate long-term impacts to emergency services would be expected. Increased visitation would result in increased demands for emergency services.

Effects of Alternative B

Alternative B calls for the most new venues and predicts the highest increase in visitation. Emergency service personnel would be required to monitor more building space, and more people would surely require more emergency attention.

Effects of Alternative C

In Alternative C, there would also be a great deal of new construction. The addition of new buildings would require additional fire protection. More visitors would also need more police and emergency response protection.

Effects of Alternative D

New building space would require fire protection. The increase in visitation would be the least with this alternative, as the fewest number of venues are added. However, the increase would require additional police and emergency services.

Effects of Alternative E

Fire protection would be needed for new building space, and the increased number of visitors would certainly require more emergency and police services.

Cumulative Impacts

The 2007 anniversary of the founding of Jamestown is expected to draw large crowds not only to Jamestown Island, but also to Jamestown Settlement, which expects to have one million visitors in 2007. Local emergency services are accustomed to handling the needs of large numbers of tourists but could be strained by such a rapid increase in visitors to the area as 2007 approaches.

Conclusion

The overall impact of the action alternatives on emergency services would be moderate. The APVA/NPS can minimize their need for emergency services by increasing the number of park rangers in the years around the commemoration and by carefully planning for emergency situations.

4.4 IMPACTS TO RESEARCH AND EDUCATIONAL PROGRAMS

Jamestown Island, as the genuine, original site of colonization, provides a rich research opportunity and is a significant educational resource. It is an “original document,” a site available for many decades of further analysis and increased understanding. By using archaeology, history, and scientific methodology, the APVA and NPS are continually uncovering and educating the public on the once hidden past of Jamestown Island and its surrounding areas.

The APVA launched the Jamestown Rediscovery™ Project in 1994 specifically to learn more of the Island’s past, as did the NPS in 1992 with its Jamestown Archeological Assessment (JAA). In addition, both the APVA and the NPS have active archaeological programs and field schools to further explore and understand the history of Jamestown.

For the APVA, the Jamestown Rediscovery™ Project and Center is a direct result of the organization revising its mission in 1991 to include an educational mission and enhance the organization’s ability to carry out that mission. The APVA also employs the *Jamestown Rediscovery™ Master Plan*, which outlines research and public education goals and its research methodology.

The National Park Service’s Advisory Board recently published *Rethinking the National Parks for the 21st Century*, which called for the NPS to become a more self-consciously educational organization. The Advisory Board recommended that the NPS “Embrace its mission, as educator, to become a more significant part of America’s educational system by providing formal and informal programs for students and learners of all ages inside and outside park boundaries.” It then continued, “Encourage the study of the American past, developing programs based on current scholarship, linking specific places to the narrative of our history, and encouraging a public exploration and discussion of the American experience.” Colonial NHP has presented curriculum based ranger led educational programs for 30 years. In addition, the park has the *Jamestown Long Range Interpretive Plan* (2000b) and recommendations from the JAA.

4.4.1 Research/Education Center Needs

In the spring of 2001, staff from the APVA and Colonial NHP, together with NPS regional education planners, local partners, and a group of local teachers participated in scoping sessions for the *Colonial NHP Education Needs Assessment* (CENA). A report produced from these sessions provides direction for future educational programming, staffing, and facilities at Jamestown. Recommendations from the report include a multi-layered learning center as part of a comprehensive education and interpretation plan and spaces specifically reserved for curriculum based school groups to participate in intensive workshops. The

report also recommended an archaeology study center, a teacher center, and dedicated activity workshops for students visiting Jamestown. The research/learning center should seek to create a community for shared research and dispersion of research to scholars and the public. By doing so at Jamestown it would:

- Provide access to 1.1 million object collection, sites, and previously unpublished research;
- Provide access to a community of researchers;
- Complement other such institutes, such as the Omohundro Institute of Early American History and Culture at the College of William and Mary;
- Provide space, support, and equipment for researchers and educators;
- Process and protect collections; and
- Produce various publications.

Both the APVA and NPS are still in the process of developing this research/education center (or “learning center” in NPS language). At the current time, and subject to APVA Board approval as well as NPS approval, the proposed Jamestown Center (its working title) would have two departments under one roof:

- Early American Historical Archaeology Institute– the research arm of the Jamestown Center
- Early American Sites Network: 16th and 17th century contact/early colonial sites – the education arm of the Jamestown Center.

The APVA and NPS would closely coordinate resources, personnel, and management of the research and education arms of the Center, but each organization would maintain their separate identities.

The research arm of the Center, the Early American Historical Archaeology Institute, would conduct research and analysis of 16th and 17th century archaeological sites and historical resources focusing on the Chesapeake Region and including the larger context of the Atlantic Basin and the contact/colonial period. The Center's research would particularly focus on the early archaeological sites at Jamestown, Jamestown Island, related sites, and the material culture of early Virginia. In general, the Center would undertake research and analysis, collections research, and knowledge dispersion. The facilities for the research arm would be located at Jamestown and should include a state-of-the-art office, conservation laboratory, public changing exhibition, lecture hall, and storage structure(s).

The Early American Sites Network (EASN), the education arm of the Center, would link together historic sites of the 16th and 17th centuries, focusing on the contact and early colonial periods. Both NPS and non-NPS sites would be included along with Jamestown, such as Saint Croix in Maine (1604), El Morro in New Mexico (1605), Plymouth Plantation in Massachusetts (1620), St. Mary's City in Maryland (1634) and San Juan in Puerto Rico (1539). Beginning with 15 already identified sites, the EASN would expand with time to include all 16th and 17th century historic sites that are open to the public, professionally staffed and managed, and interested in a collaborative network. The network would provide electronic linkages through a dedicated web site, online symposia, and links with others to develop a virtual community with Jamestown as the hub. Emphasis would be on improving the public's understanding and the scholarly resources available, using electronic communications and in-person visits.

As proposed in the 2001 *Colonial National Historical Park Education Needs Assessment* educational staff and facilities in the education arm of the Jamestown Center should include the following: 1) An appointed education program coordinator, 2) A teacher's advisory board, 3) Four dedicated

"experience spaces" (classrooms) where intensive hands-on learning can take place. A traditional meeting room(s) would also be needed for institute and teacher workshops.

In addition, the education arm of the Center should have four "experience spaces/classrooms." This space would be used for preparing group education field experiences and also for the training of teachers. In addition, the classrooms could be set up for unique educational opportunities specifically linked to the Jamestown interpretive themes (see "Section 4.5: Impacts to Visitor Experience" and "Table 4-20: Haley Sharpe Interpretive Themes") which would allow students to learn the story of Jamestown in a non-traditional setting. The "experience spaces/classrooms" could consist of the following:

- An archaeological excavation with an adjacent lab;
- The interior of an Elizabethan room to evoke connections to England;
- The interior of a Jamestown building, such as a room in the statehouse; and
- A room with American Indian characteristics to evoke connections to the Powhatans.

On the Townsite, students could then trace the themes learned in the classrooms through to the exhibits within the Townsite.

Overall, the Jamestown Center would serve varied audiences, including scholarly researchers, graduate/undergraduate students, K-12 students and teachers, and life-long learners such as elder hostel participants. A university model would be followed that allows for the individual authority of each institution be recognized and respected but allows both the APVA and NPS to pursue their goals of more coordinated research under the banner of Jamestown. The APVA would focus their efforts on 17th century archaeological research in the Chesapeake region; curatorial, historical and

scientific research; and outreach focusing on the undergraduate/graduate/ scholarly community and lifelong learners. The NPS would focus on archaeological research, historical research, scientific research, and curatorial research, with a focus on the K-12 community and lifelong learners. Research findings from each would be shared with the other as quickly as possible. The Center is not envisioned as one building, but a “campus concept” as created through the alternatives. All programs would be coordinated, jointly planned, and jointly credited as appropriate. Dedicated classroom space would be available solely for educational programs.

As envisioned, a director would be appointed to coordinate the Center’s work with an APVA/NPS board to oversee the director’s work. Spatial needs would be located at the Jamestown Rediscovery™ Center and within the Visitor Center where classrooms and meeting spaces would most likely be located. Additional classroom space may also be located around the Townsite as appropriate space is available. Electronic infrastructure would also be required. Simultaneous access to both the APVA and NPS portions of the Jamestown collection would be essential.

4.4.2 Methodology

Each of the Jamestown Project alternatives has been assessed based on how well they meet the educational and research needs as described by the 2001 *Colonial National Historical Park Education Needs Assessment* and as envisioned within the previously described Jamestown Center. Impacts were qualified as minor, moderate, or major, which are defined as follows:

Minor: The proposed actions would not meet or would barely meet the education and research needs as described by the 2001 *Colonial National Historical Park Education Needs Assessment* and as envisioned within the Jamestown Center.

Moderate: The proposed actions would meet the educational and research needs as described by the 2001 *Colonial National Historical Park Education Needs Assessment* and as envisioned within the Jamestown Center.

Major: The proposed actions would exceed the educational and research needs as described by the 2001 *Colonial National Historical Park Education Needs Assessment* and as envisioned within the Jamestown Center.

4.4.3 Effects of Alternative A (No Action)

The No Action Alternative proposes no new construction or renovations so the Jamestown Center would merely be a collaborative effort between the APVA and NPS. Overall, the impact of Alternative A on education and research would be negligible.

4.4.3.1 Research

Research programming would continue and increase to a limited extent due to current plans through the APVA Jamestown Rediscovery™ Project and NPS archaeological research. Educational programming would also see some operational improvement due to plans to add an education specialist to the park staff and to follow through on proposals in the CENA report. The historical archaeological programs conducted by the APVA and NPS would remain separate, with distinct staff, facilities, and project goals. Archaeological field schools would be conducted apart from each other. APVA and NPS curatorial operations would be housed in separate facilities. Outside researchers would be required to access the artifact and document collections in two distinct places. Likewise, the libraries would remain in two different buildings and would be maintained by each organization separately, which would entail at least some duplicated publications.

4.4.3.2 Education

APVA and NPS educational programming would remain distinct as well. This would cause hardships for educational groups visiting the site because program reservations would be separate, and education programs offered by the APVA and NPS could potentially be repetitive or disjointed.

Opportunities to increase on-site interactive programs would be limited, because only one multipurpose room would be available for programs, and this room would often be reserved for other functions such as meetings, lectures, staff training, or special events. Likewise, education staffing would remain low making it impossible to greatly increase the number of education programs offered to school groups.

4.4.4 Impacts Common to the Action Alternatives

4.4.4.1 Research

Research planning and operations would be conducted with joint participation by the APVA and NPS with some variation between the action alternatives. Physical archaeological research, such as field schools and active digs, would also be coordinated to a greater extent.

4.4.4.2 Education

Within the action alternatives, education opportunities would be improved for many reasons. First, educational programming would be jointly coordinated. In addition, in each alternative additional space would be available for interactive educational programs. The primary Jamestown themes would be presented to education groups at many locations throughout their visit, resulting in more opportunities for students to master these themes and gain greater understanding of the Jamestown story. Artifacts would be on display at many venues, including the Visitor Center, Observation Building, Ludwell exhibit area, and mobile archaeology stations. This would put the artifacts in context to their place in Jamestown and link the artifacts and features on the Townsite to the Jamestown story.

Along the Island Loop Drive, interpretive signage would be improved, which would further educate visitors and expose them to areas of Jamestown that are pristine and relatively untouched by development.

4.4.5 Effects of Alternative B

Overall, Alternative B would result in major impacts to research and educational programming at Jamestown.

4.4.5.1 Research

Alternative B would place the research arm of the Jamestown Center in the expanded Jamestown Rediscovery™ Center. Both the APVA and NPS collections of artifacts and documents related to Jamestown would be stored within this facility, which would allow for coordinated conservation, processing, documentation, research, and interpretation of the artifact collections. For managerial purposes, APVA and NPS staff would maintain the collections separately. In addition, a research and staff library, where the materials from each institution would be housed and maintained appropriately, would provide for consolidation of all research materials, as well as joint research space.

For researchers, having the collections housed together with adequate workspace would allow for simultaneous access to both collections, thus decreasing travel time and duplication of effort. Also, by having a consolidated research effort in one location, the APVA and NPS could effectively coordinate field schools and historical archaeology research projects throughout Jamestown Island.

4.4.5.2 Education

Under Alternative B, the educational arm of the Jamestown Center would be located in the new Visitor Center proposed in the existing parking lot. As described above, both the APVA and NPS would operate their educational programs in this facility. This would allow for coordinated programs and site

tours. Also, the close proximity of the educational facility to the Townsite would be advantageous to educational program directors, interpreters, and park rangers and volunteers providing visitor tours. The size of the replacement Visitor Center would allow educators to have designated office and educational space.

The “experience spaces/classrooms” would be located in the Jamestown Center campus, adjacent to the Visitor Center in the parking lot, with some spaces in the Townsite as close as possible to the resources, possibly in a portion of the Observation Building or in the Ludwell exhibit facility, an appropriate, logical location for the archaeology “experience space.”

4.4.6 Effects of Alternative C

Alternative C would result in moderate impacts to research and education at Jamestown, as described below.

4.4.6.1 Research

Alternative C proposes a new NPS collections/research facility on Neck of Land, while the APVA collections and research would remain on the Island in the Jamestown Rediscovery™ Center. The storage, management, staffing, and availability of the collection for access by researchers would be separated physically and managed independently. Impacts would be similar to those listed under Alternative A above. However, the new Neck of Land facility would improve collections storage and provide research space for the NPS. APVA research space would remain at the Jamestown Rediscovery™ Center, thus fragmenting the research arm of the Jamestown Center.

4.4.6.2 Education

Under Alternative C, the educational arm of the Jamestown Center would be located in the new Visitor Center at Neck of Land. This results in a disjointed field experience for groups participating

in programs at Jamestown. Once the classroom experience is complete, the students would then need to be transported to Jamestown Island to continue their visit. This would present logistical difficulties for school groups and would physically separate the workspace for educational program directors, interpreters, and park rangers and volunteers providing visitor tours from the actual site. Because of this physical separation, coordinated education efforts with the APVA would also potentially be hindered.

4.4.7 Effects of Alternative D

Overall, Alternative D would affect research and education at Jamestown moderately. These impacts are discussed below.

4.4.7.1 Research

With the NPS collections remaining in the existing Visitor Center and the APVA collections remaining in the Jamestown Rediscovery™ Center, the storage, management, staffing, and availability of the collection for access by researchers would be separated physically and managed independently. Impacts would be similar to those listed under Alternative A above. However, the existing Visitor Center would be reconfigured to improve the collections storage area and provide some additional research space for the NPS. APVA research space would remain at the Jamestown Rediscovery™ Center, thus fragmenting the research arm of the Jamestown Center.

4.4.7.2 Education

Under Alternative D, the educational arm of the Jamestown Center would be located within the reconfigured Visitor Center. By keeping this function where it currently resides, school groups visiting the site would have easy access from exhibit/classroom areas to the fort site and Townsite. This would also be advantageous to educational program directors, interpreters, and park rangers and volunteers providing visitor tours.

With the Visitor Center, education, collections, research, and Observation Building functions all housed in one building, space would be limited. To accommodate the many functions, space may not be dedicated solely for educational purposes. This would limit the number of educational programs that can be offered to school groups. In addition, there would be smaller exhibit areas with less opportunity to present the themes to students and other visitors.

4.4.8 Effects of Alternative E

Like Alternatives C and C, Alternative E would result in moderate impacts to research and educational programming.

4.4.8.1 Research

Under this alternative, the NPS collections would be stored in a remote location, away from Jamestown Island, while the APVA collections would remain in the Jamestown Rediscovery™ Center. The storage, management, and staffing of the collections would be separate, thus the availability for access of the collections by researchers would be impacted. This is contrary to the goal of joint APVA/NPS operations and would result in fragmentation of the research arm of the Jamestown Center.

4.4.8.2 Education

In Alternative E, the educational arm of the Jamestown Center would be located in the new Visitor Center within the existing parking lot on Jamestown Island. This proposed facility would be smaller than the facility proposed in Alternative B, thus space would be limited. This would limit the number of educational programs that could be offered to school groups, which effectively curtails the educational arm of the Jamestown Center. On the other hand, the close proximity of the educational facilities to the Townsite would be advantageous to educational program directors, interpreters, and park rangers and volunteers providing visitor tours.

4.4.9 Cumulative Impacts

With increased coordination of the research operations at Jamestown, the prestige of Jamestown as a research center would improve, placing Jamestown Island (both the APVA and the NPS) on higher standing within the research, museum, and academic communities. The improved educational field experiences available to educational groups would make Jamestown Island an irresistible site for learning that would bring more groups to Jamestown Island. The educational opportunities for students and teachers would assist with the standards of learning relating to early colonial American history.

4.4.10 Conclusion

Table 4-18 provides a summary of impacts to research and education for each of the alternatives. Within the table, impacts are examined with respect to education programs, archaeology excavations and field schools, curatorial collections and research, the library, and archival research.

Overall, each of the alternatives provides some beneficial impact to research and education at Jamestown. Alternative A would just barely meet the needs of the 2001 *Colonial National Historical Park Education Needs Assessment* (a minor impact), while Alternatives C, D, and E would have moderate effects on research and education needs. Alternative B achieves APVA and NPS research and education objectives the best. This alternative places the Jamestown Center in a joint campus with facilities to support both the research and educational arms of the learning center. In the research arm the collections are under one roof. Along with this would come many benefits – staffing interactions, ease of access for researchers, and more coordinated management and interpretation. Site libraries would be also housed together in the alternative. With the facilities to support the Early American Historical Archaeology Institute, Jamestown would become recognized as the premier 17th century research facility in the U.S.

In the educational arm of the Jamestown Center the educational benefits with Alternative B are highest. There is dedicated education space, easy access to the site for education groups, and exhibit space providing greater opportunities for students to comprehend the Jamestown interpretive themes. The dedicated education space would be theme related in layout, providing captivating opportunities to engage students in learning experiences. With the facilities to support the Early

American Sites Network, the opportunity to convey the Jamestown story to students and visitors at related 17th century sites nationwide would exist.

All of the alternatives would have varying degrees of beneficial effects on research and education programming at Jamestown; therefore, none of the alternatives would result in an impairment of research or educational programming at the site.

Table 4-18: Summary of Impacts to Research and Education

Topic	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Education Programs	Separate APVA/NPS education programs. One classroom in Theater II of current Visitor Center, when available.	Joint APVA/NPS education programs. Classrooms located in Visitor Center in Island parking lot and/or distributed at appropriate locations throughout site.	Joint APVA/NPS education programs. APVA/NPS classrooms at Visitor Center at Neck of Land and at Rediscovery Center.	Joint AVPV/NPS education programs. Classrooms located throughout site as space is available, but space is not dedicated solely for educational purposes.	Joint APVA/NPS education programs. Classrooms located in Visitor Center in Island parking lot and/or distributed at appropriate locations throughout site.
Archaeology Excavations and Field Schools	Separate APVA and NPS research projects.	Joint field schools and coordinated excavations.	Joint field schools and coordinated excavations.	Joint field schools and coordinated excavations.	Joint field schools and coordinated excavations.
Curatorial Collections & Research	Performed separately. APVA at Jamestown Rediscovery™ Center and NPS in basement of Visitor Center.	Joint facilities as part of the Jamestown Rediscovery™ Center.	Performed separately. APVA at Jamestown Rediscovery™ Center and NPS at Neck of Land Visitor Center.	Performed separately. APVA at Jamestown Rediscovery™ Center and NPS in expanded Visitor Center on current site.	Performed separately. APVA at Jamestown Rediscovery™ Center and NPS at an off-site location.
Library	Separate APVA and NPS libraries.	One library as part of joint facility at Jamestown Rediscovery™ Center.	Separate libraries. APVA at Jamestown Rediscovery™ Center and NPS at Neck of Land Visitor Center.	Separate libraries. APVA at Jamestown Rediscovery™ Center and NPS in expanded Visitor Center on current site.	Separate libraries with APVA at Jamestown Rediscovery™ Center and NPS located with staff offices.
Archival Research	Separate facilities.	Joint facilities in Jamestown Rediscovery™ Center.	Separate facilities.	Separate facilities.	Separate facilities.
Overall Impact	Minor	Major	Moderate	Moderate	Moderate

4.5 IMPACTS TO VISITOR EXPERIENCE

4.5.1 Methodology

The following documents provided the basic framework for considering the impacts of the various alternatives to the overall visitor experience: the *Strategic Plan for Colonial National Historical Park, Fiscal Year 2001-2005* (Colonial NHP 2000a), *Jamestown Long-Range Interpretive Plan* (Colonial NHP 2000b); *Haley-Sharpe Design Jamestown Island Project: Interpretive Alternatives Discussion Document* (Haley Sharpe Design 2001b), the *Visitor Services Project* (University of Idaho 1988), the *APVA Visitor Survey* (1997), the *GPR Survey* (University of Idaho 2001a), *Draft Green Spring General Management Plan and Environmental Impact Statement* (NPS 2001b), and the *Colonial National Historical Park-Jamestown Island Visitor Study, Summer 2001* (University of Idaho 2001b). Within the framework established by these documents, information obtained from visitor surveys, general comments, and stakeholder meetings was used to draw conclusions regarding the impact of various alternatives to the visitor experience. To provide additional detail on the sources of input:

- Previous visitor surveys and comments regarding facilities indicate that visitors enjoy the Park Ranger guided tours, the living history character tours, and the Glasshouse demonstrations (University of Idaho 1988).
- Comments from the visiting public, which are provided through comment forms and the park's visitor registration book, provide insight into what programs and facilities met visitor expectations and what did not. Their most frequent complaints were the following: the walking distance from the current parking lot to the Jamestown Visitor Center; the quality of the restrooms at the

footbridge; the lack of food service; the confusion of the townscape; and the lack of information on the American Indian and African American Jamestown story in the museum exhibit area.

- Numerous stakeholder meetings (especially with the American Indian and African American communities) and general public meetings generated comments on the direction that should be taken to enhance the visitor understanding of Jamestown.

In addition to the assessments made under these programs and ongoing evaluations, the impact analysis applied the NPS Government Performance Results Act Goal Category II – “Provide for the Public Use and Enjoyment and Visitor Experience of Parks” – in developing the definitions for the impact intensities. This category includes all goals for visitor satisfaction, enjoyment, safety, appreciation, and understanding. It includes the mandate found in the NPS Organic Act “to provide for the enjoyment of the [resources] in such manner and by such means as would leave them unimpaired for the enjoyment of future generations.” Specifically, the following goals were applied:

- IIa: Visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities and services, and appropriate recreational opportunities.
- IIb: Park visitors and the general public understand and appreciate the preservation of and its resources for this and future generations.

Based upon these factors, the definitions for the impacts are defined as follows:

Negligible: An action that would not increase the number of services or facilities available for visitors nor provide improved accessible and diverse

programs and opportunities. The action would not enhance the public's understanding and appreciation of the resources and their significance.

Minor: An action that would provide very limited improvements to the existing facilities and services therefore minimizing the overall visitor enjoyment and understanding of the resources.

Moderate: An action that would cause measurable improvements to the overall visitor experience in the areas of visitor facilities and services, thereby expanding the accessibility and diversity of programs and opportunities. The action would enhance the public's understanding and appreciation of the resources in measurable ways.

Major: An action that would demonstrate great improvements to the visitor experience in the areas of improved visitor facilities and services, especially in the areas of accessibility and diversity of programs and opportunities. The action would significantly expand the means and methods to enhance the public's understanding and appreciation of the resources.

4.5.2 Visitor Projections and Studies

To assess the impact of increased visitation on the visitor experience, projections for visitor use at Jamestown were developed using the best available data. In addition to historic trends, the potential effects of increased visitation at Jamestown Settlement, Yorktown National Battlefield, and Colonial Williamsburg were considered. Based on recorded monthly visitation in 2000, visitation was projected to 2005 using existing patterns. From 2005, monthly visitation and probable annual average visitation were projected for each alternative. These numbers are displayed in Table 4-19.

The NPS Cooperative Studies Unit of the University of Idaho conducted a new visitor survey for Jamestown in June 2001. According to the survey, the following facilities ranked among the top four

interpretive services that visitors would like to see more of or improved: living history, self/audio tour, history education, and an interactive archaeological program. Respondents also noted that they would prefer to keep the original site intact and see better coordination between Jamestown Island, Colonial Williamsburg, and Jamestown Settlement.

In addition, the JLRIP identified the following groups as targeted audiences for new efforts to increase visitation:

- Visitors who use the Internet to gather information and increase knowledge;
- Local residents;
- American Indians and African Americans whose untold stories need to be told in the context of the whole Jamestown story;
- Teachers and students, both on- and off-site, including home school students; and
- Life long learners.

4.5.3 Effects of Alternative A (No Action)

The decision to take no action would limit the ability of the APVA and NPS to promote an enhanced understanding of the site. Under Alternative A, the partnership could not capitalize on recent research to provide a more complete history of Jamestown. The findings of this research would be provided to the public through special events and programs that reach only 5% of the visiting public. As such, Alternative A would amount to a "lost opportunity."

The No Action Alternative would prevent integration of recently gained knowledge into the interpretive programs on the Island. Existing programs do not address the diverse cultures of the Virginia Indians and African-Americans, nor do they address the resources associated with recent archaeological findings. Visitor comments are generally negative regarding the lack of information provided on the Virginia Indians, African-Americans, and slavery.

Table 4-19: Projected Visitation for 2005, 2010, 2015, and 2020

	January	February	March	April	May	June	July	August	September	October	November	December	Totals
2000													
Existing Visitation	6,163	10,875	31,002	57,745	42,729	45,555	46,688	36,349	25,728	37,868	25,475	12,783	378,960
2005													
Projected Visitation	6,770	11,950	34,060	63,440	46,950	50,050	51,300	39,940	28,270	41,600	27,990	14,040	416,360
2010													
Alternative A	7,440	13,130	37,420	69,700	51,580	54,990	56,360	43,880	31,060	45,710	30,750	15,430	457,450
Alternative B	8,240	14,540	41,440	77,180	57,120	60,890	62,410	48,590	34,390	50,610	34,050	17,080	506,540
Alternative C	8,240	14,540	41,440	77,180	57,120	60,890	62,410	48,590	34,390	50,610	34,050	17,080	506,540
Alternative D	7,790	13,750	39,200	73,020	54,040	57,610	59,040	45,970	32,540	47,880	32,220	16,160	479,220
Alternative E	7,900	13,940	39,740	74,020	54,780	58,390	59,850	46,600	32,980	48,540	32,660	16,380	485,780
2015													
Alternative A	8,170	14,430	41,110	76,580	56,670	60,420	61,920	48,210	34,120	50,220	33,780	16,950	502,580
Alternative B	10,030	17,690	50,420	93,900	69,500	74,080	75,930	59,120	41,840	61,570	41,430	20,780	616,290
Alternative C	10,030	17,690	50,420	93,900	69,500	74,080	75,930	59,120	41,840	61,570	41,430	20,780	616,290
Alternative D	8,970	15,830	45,120	84,040	62,200	66,310	67,950	52,910	37,450	55,110	37,080	18,600	551,570
Alternative E	9,220	16,260	46,370	86,360	63,910	68,120	69,830	54,370	38,480	56,630	38,110	19,110	566,770
2020													
Alternative A	8,980	15,850	45,170	84,140	62,260	66,380	68,030	52,970	37,490	55,180	37,110	18,620	552,180
Alternative B	12,200	21,520	61,340	114,240	84,560	90,130	92,380	71,930	50,900	74,910	50,410	25,280	749,800
Alternative C	12,200	21,520	61,340	114,240	84,560	90,130	92,380	71,930	50,900	74,910	50,410	25,280	749,800
Alternative D	10,320	18,220	51,930	96,730	71,590	76,320	78,210	60,900	43,100	63,430	42,680	21,410	634,840
Alternative E	10,760	18,970	54,100	100,760	74,570	79,480	81,470	63,430	44,900	66,070	44,460	22,300	661,270

This alternative would also limit the staff to using existing facilities, which do not adequately convey the primary themes of the Island’s cultural and natural resources. Designed in the 1970s, the Visitor Center’s exhibit area displays artifacts with little or no association to the cultures and people of Jamestown. Visitor comments indicate dissatisfaction with the fact that current exhibits are the same ones that they saw 25 years ago. Based upon the 2001 *GPRA Visitor Survey*, 97% of visitors to Jamestown Island were satisfied overall with

appropriate facilities, services, and recreational opportunities; however, only 72% understood the significance of the site.

Alternative A would have an adverse impact to the visitor experience and would offer little incentive for visitors to return to Jamestown. By limiting the visitor’s understanding and appreciation of the significance of Jamestown, the decision to take no action would jeopardize public support of the Island’s preservation. This action would be a

negligible impact on the visitor experience because it would not provide any improved services or facilities, nor provide any significant opportunities to enhance the visitor's understanding of the resource.

4.5.4 Impacts Common to the Action Alternatives

Because all of the action alternatives have some common elements, they also have certain common impacts. Generally these can be categorized as impacts to: Transition and Site Orientation; Site Interpretation; Transportation; and Archaeology/Collections.

4.5.4.1 Transition and Site Orientation

Each of the action alternatives would enhance the transition from the parking area to the hallowed ground of the historic core, as well as improve the visitor's orientation to the site.

Improved Transition Walkway and Bridge to the Historic Core

The current transition from the parking lot to the Visitor Center/historic area does not provide adequate orientation or sense of arrival. The new walkway and footbridge would include overlooks that orient visitors to the Pitch and Tar Swamp. Views from this transition area would provide a sense of arriving at historic Jamestown, with visitors able to see the James River and the only extant 17th century building on the site (the Church Tower). This improvement would facilitate interpretation of the natural environment and its crucial relationship to the people of Jamestown, a relationship that forms a central part of the pre-1700 Jamestown story.

Improved Orientation and Visitor Center Facility

Better orientation and introductory interpretive exhibits would allow visitors to glean more from their visit. In particular, an improved overview of the diverse and long human history of the Island would let visitors better understand that there are many different phases of its history. These include

the interactions among three very distinct cultures (American, European, and African). At present, these phases are inadequately represented in the 1970s-era museum exhibits in the current Visitor Center. New interactive exhibits that relate the artifacts and findings from recent research would enable visitors of all ages to comprehend the significance of Jamestown to the development of the United States and the complex relationships of the three cultures. The role of this English settlement in the transformation to an independent society would be enhanced through links with related park sites and Colonial Williamsburg. Connections to Green Spring would be provided through interpretive messages and displays on Governor William Berkeley and Bacon's Rebellion. Thematic connections to Colonial Williamsburg and Yorktown would be presented through interpretive presentations, interpretive media, lecture series, and special tours focusing on the social, political, and economic changes resulting in the American Revolution.

4.5.4.2 Site Interpretation

Interpretive themes, the concept of "Discovery," and specific site improvements would combine to enhance the degree and accuracy of interpretation for the visitor.

Enhanced Thematic and Conceptual Development

The eight themes presented in the *Jamestown Island Interpretive Plan* (Haley Sharpe Design 2001b) (Table 4-20) would enable visitors to understand the site and draw together interpretive elements in a more comprehensive and connected manner. Visitors would be able to make more sense of the relationships among archaeological remains, artifacts, the environment, and landscape features. The multiple perspectives addressed by the themes would make it possible for the latest historical research and writing to reach visitors, allowing enhanced interpretive opportunities for greater appreciation and understanding of Jamestown by visitors.

Table 4-20: Haley Sharpe Interpretive Themes

Theme	Description
1. Atlantic Worlds	This theme 'sets the scene' for the history of the Island and explains the context in which Jamestown became a place on an English map. Broad comparisons are made between the nature of American Indian life and society in Virginia and the societies of Europe and Africa during the century before 1607. The natural setting of the Island is also explored.
2. Struggles for Survival	This theme concentrates on the more basic aspects of physical survival during the years of Jamestown as the capital of Virginia – struggles against the elements, struggles for sustenance, threats to health, and threats posed by other people. The struggles of different groups and individuals are examined, Europeans, Africans and Native Americans, and the way that these groups interacted in their struggles.
3. Economic Experience	This theme brings together much of the archaeological remains on site and associated artifacts, which concern the economic activity at Jamestown. This activity can be broadly characterized as a series of experiments, both in terms of the search for viability and prosperity, and in terms of the economic relationships being formed amongst and between different cultures and peoples.
4. A New Society	This theme is characterized by the experimental cultural interactions between different peoples during the emergence of a new society in Virginia in the 17 th century. The key legacies of that process in the development of modern America are highlighted, both good and bad: representative government, law, custom, a slave society, and the near annihilation of the American Indian society and culture in Tidewater Virginia.
5. Fort to 'Cittie'	This theme focuses on the development of the urban community on Jamestown Island itself, and the expansion into the outer Island. This is partly characterized as an experiment in urban planning.
6. Jamestown and Beyond	This theme focuses on the connections beyond Jamestown Island itself. American Indian sites demonstrate early connections to distant parts of the North American continent. Colonial expansion fans outwards from Jamestown up and down the James River and Chesapeake Bay. Jamestown acts as the 'hub' of the colony, being the capital and prime port of Virginia, and thus being the common link with outlying areas. Jamestown is an interchange point in a wider Atlantic World. Highlighted in this theme are the cultural differences in notions of property and the use of land, which are pivotal to the development of colonial expansion and the character of relationships between Europeans and American Indians.
7. Discovering the Past	This theme discusses and highlights the process of investigating the past, using Jamestown and its abundant resources to illustrate this. The whole Island is shown to be a study resource and the combination of disciplines (scientific and historical) in that study is explained. Although this is a separate theme, which would clearly be linked to sites of archaeological excavation, the use of evidence and the exploration of the investigative process are not confined here. These underpin all the other themes as an integral part of the concept of Discovery that informs the visitor experience.
8. Legacies	This theme encompasses a broad view of the legacies of Jamestown, with an emphasis on the role that the visitor themselves can play in the ongoing legacy. The legacies identified within the other main themes are reiterated.

The interpretive concept of “Discovery,” relating the processes of archaeology and research to understanding the artifacts and other visible resources, would enrich visitor understanding of the site. The Discovery concept links the history of people and events to the investigation of evidence of the Island’s cultural and natural resources. This immediacy – looking at the evidence on the actual site of the human dramas – would position Jamestown Island clearly in the public perception as the original historic site. This would emphasize the importance of preserving the site’s physical legacy, ongoing research, and the public’s own participation in the guardianship of its history.

Improved Interpretive Program

Interpretive “Anchor” Locations

The use of key interpretive activities at either end of the historic core would enhance the visitor experience by focusing on specific aspects of 17th century Jamestown and encouraging visitors to explore the whole site. At the Agricultural exhibit area, replica structures and a costumed demonstration program would enhance the understanding of the importance of growing food and commodity crops, the impact on the environment of agricultural production, the precariousness of dependence on local resources, and the common types of architecture found in Jamestown and Virginia. In particular, an examination of tobacco in its wider social, economic, and political context would bring together the aspects of the labor force (indentured servants and slaves), the everyday life of women and children, and the role of tobacco in securing Virginia’s economic viability.

The other key “anchor” at the Ludwell Site would explore the nature of the physical structures in the context of the process of archaeological investigation and historical evidence. Through demonstrations of construction and craft techniques, which are an extension of the research program, visitors would see how the evidence of research is translated into

suppositions about the past that can then be tested. These two new exhibit areas would build upon and provide an extension of the current glass-blowing demonstration at the Glasshouse and the living history program provided in New Towne.

Interpretive Stations/Enhanced Cultural Landscape

Low-key interpretive stations would provide a three-dimensional perspective and immediate reinforcement that a printed brochure could not. This arrangement would give visitors the best understanding in their limited time; they would not have to wander the entire site, trying to discover the key points of interest for themselves. These stations would complement improvements to Jamestown’s cultural landscape that would relate the various developmental stages of the colony from fort to capital to private plantation. The different types of structures and businesses as well as the multi-cultural make-up of its population would be presented in a way that would allow visitors to make their own connections to the place.

Ambler House Ruins Viewing Platform

The viewing platform placed inside the Ambler House Ruins would provide an overview of the New Towne area. The interpretive waysides and panels would enable visitors to understand the transformation of Jamestown from a small settlement to a bustling town and through its many periods of boom and bust.

Site Overlooks (Powhatan Creek and Ambler House)

Opportunities to see the site from a higher vantage point would improve the way visitors understand the landscape and in particular the townscape. The connection between the site and the James River would also become clearer.

Island Loop Drive

The visitor survey (University of Idaho 1988) indicated that 49% of all visitors in the summer explored the Island Loop Drive. With improved interpretation and limited vehicular access on the

Loop Drive, visitors would better understand the events that occurred on the outer Island. In particular, linking interpretation more closely to the archaeological evidence (without endangering that evidence) would reduce visitor confusion. Now, the connection of activities on the core site to the outer Island is unclear. A bus shuttle around the loop would provide a wider range of interpretive experiences as part of the journey, including interpretation done live, by a person, rather than by a recording. This would also enhance the passive, recreational users who walk or ride their bikes on the Loop Drive by limiting the number of private vehicles and providing more engaging waysides.

4.5.4.3 Transportation

Improvements in transportation to the Island and on the Island would enhance the visitor experience significantly. Better access and modal transfers would first of all provide opportunities for the interpretive experience to begin earlier. This would enable visitors to spend less time in the Visitor Center and more time on the site, where their contact with the cultural and natural resources would be the primary aspect of their visit.

Furthermore, in each action alternative except Alternative D, multimodal transportation routes (hike/bike/boat/tram) would increase the opportunities for site interpretation when visitors arrive, especially with regard to the natural environment, the geography of the Island, and the significance of its water connections. Visitors approaching the Island on foot, bike, or boat would gain a greater appreciation of its resources, the interaction of past inhabitants (Indian and non-Indian) with the environment, and efforts to preserve this fragile environment and the species that inhabit it. New waysides and publications would be developed for the new walkways and facilities at Neck of Land and Powhatan Creek Overlook. These additional services would enhance the understanding of the significance of the resources to more than an estimated 50,000 visitors by 2010 (this figure is 10% of the estimated 500,000 visitation in 2010).

4.5.4.4 Archaeology/Collections

Protection and display of the Jamestown collection is a primary goal of the project. All of the action alternatives include measures designed to meet this goal.

Observation Building

This structure is fundamental to the Discovery concept for the interpretive scheme. Less than 1% of the Jamestown collection is currently on exhibit, providing only a glimpse of Jamestown's extensive history. The Observation Building would increase visitor understanding of the significance of a greater number of artifacts displayed within thematic interpretive contexts that are linked to specific locations on the site and to personal stories associated with them. Crucial to this is the ability to see artifacts in a protected environment and provide views across the site simultaneously. The connection of the artifacts to archaeological sites, landscape features, and historic structures would provide a more seamless experience in connecting the APVA owned Old Towne portion of Jamestown with the NPS owned New Towne area. This would improve the visitor's overall understanding of the site.

Mobile Archaeology Units

These units would be deployed at active archaeological digs and would enhance visitor understanding of both the processes of archaeological investigation and the results for a particular site. Archaeologists and volunteers cannot always be available to speak to visitors. These units would provide a core base level of information, allowing visitors to ask more focused and deeper questions of the experts. Visitors would also be able to see artifacts displayed as they are unearthed, thus providing a practical and exciting experience.

In addition to these common impacts, each of the action alternatives would result in additional impacts to the visitor experience, as explained below.

4.5.5 Effects of Alternative B

This alternative would provide a comprehensive interpretive experience encompassing the entire Island and pre-arrival orientation sites. A new, fully accessible Visitor Center would be located in the current parking lot, away from the Townsite area. This Visitor Center would have dedicated interpretive functions for orientation and provide those with physical disabilities easier access to the start of their tour. It would eliminate the confusion for visitors as to what to do first and where they are in relationship to the historic area. Moving this facility from the Townsite would enable the current structure to be reduced in size and serve as the Observation Building, connecting the artifacts to the original site. The hike/bike trail and bridge across the Back River would provide another opportunity for interpretation as the natural resources and the expansion of the colony are interpreted (*Jamestown Project Newsletter* April 2001). Alternative B would engage the visitors in exploring and discovering Jamestown and its rich history by providing a myriad of experiences that connect the people to the resources and would therefore greatly increase visitor understanding.

4.5.6 Effects of Alternative C

In this alternative, the Visitor Center would be located off the Island at Neck of Land and would be combined with the Intermodal Transportation Terminal, and visitors would receive an initial part of their orientation before arriving at the Island. The sense of arriving at the original site would therefore be lost and would result in more confusion for the public in understanding the context and significance of Jamestown Island. The other interpretive facilities identified in Alternative B would promote the same enhanced visitor understanding and experience previously identified.

4.5.7 Effects of Alternative D

The location of the Visitor Center and Observation Building in one facility would limit the ability to orient visitors prior to their exposure to artifacts and interpretation. Furthermore, the building's size would limit the space allotted for both orientation and interpretation. Visitors arriving in the parking lot would continue to be disoriented and unsure of how to approach the historic area. There is a lesser benefit from the transition walkway to the historic site in this alternative, since visitors would not first have an introductory orientation program. This alternative also would diminish the visitor experience by retaining an exceptionally large facility in the heart of the historic area.

This alternative would provide the least improvement in visitor understanding through the various modes of transportation because it does not include a gateway at Neck of Land. Although visitors would benefit from key views, they would not come into contact with the natural environment before reaching the Island in the way that they would in other alternatives. Instead, the hike/bike trail would follow the roadway. The anchor sites at the Ludwell exhibit facility and the Agricultural exhibit area would promote the expanded visitor experience as previously identified.

4.5.8 Effects of Alternative E

This alternative is similar to Alternative B in providing a Visitor Center in the parking lot as well as the Observation Building and anchor sites in the historic area. The boat dock would provide visitor access to the Island but not to Powhatan Creek Overlook. This would eliminate boat access to the Glasshouse and a potential interpretive experience.

4.5.9 Cumulative Impacts

By enhancing the visitor experience, each of the action alternatives would have beneficial cumulative impacts. New information, as well as traditional programs presented in a better manner, would draw positive attention to Jamestown, making it a more popular attraction. Furthermore, enhanced comfort facilities would encourage longer and more frequent visits. The cumulative impacts of Alternative B, which most enhances the visitor experience, would be greater than the other alternatives.

4.5.10 Conclusion

The No Action Alternative would prevent the partnership from meeting the interpretive goals identified in the *Jamestown Long Range Interpretive Plan* (Colonial NHP 2000b). It would also forego opportunities to increase visitor understanding of the resources and the significance of Jamestown.

Alternative B would best enable Colonial NHP and APVA to achieve the goals identified in the *Jamestown Long Range Interpretive Plan* regarding the visitor experience. Under this alternative, the greatest number of interpretive opportunities would be available to visitors during pre-visit, approach, and on-site experiences. The comprehensive use of a variety of media with direct relationships to natural and cultural resources would maximize the presentation of primary themes. Alternative B would have a major impact on the visitor experience due to the multitude of additional facilities and opportunities to enhance the overall visitor experience. It would potentially increase visitor satisfaction to 99% and visitor understanding to more than 90%.

Most of the positive impacts of Alternative B would result from Alternatives C and D as well. However, under Alternative C, the disconnected Visitor Center at Neck of Land would greatly reduce visitor time on the Island. This would diminish the possibility of a seamless interpretive experience and visitor

understanding of Jamestown. This alternative would have a minor impact on the visitor experience in that there would be new facilities and expanded interpretation of the resources; however, the positive impacts would be adversely affected due to the distance of the Visitor Center from the resource. The percentage of satisfied visitors would not increase and could possibly decrease. Visitor understanding would increase slightly.

Alternative D differs from Alternative B in that the exceptionally large (three-story) Visitor Center/Observation Building/collection storage would dominate the landscape and dwarf the extant resources. Also, the lack of boat access to the Island would limit visitor understanding of the relationship of the cultural and natural resources. While this alternative would enable Colonial NHP and the APVA to meet some the goals for increasing visitor understanding, it would greatly compromise the historic scene and would negatively impact the overall visitor experience of historic Jamestown. This alternative would have a minor impact to the overall visitor experience. Visitor satisfaction with facilities would not increase significantly, perhaps by only 1% with the new exhibits and anchor sites. Visitor understanding would increase only marginally with the addition of the anchor sites but not as much as possible without the alternative modes of transportation and the gateway at Neck of Land. It would increase by only 3 to 5%.

The reduced square footage of both the Visitor Center and the Observation Building in Alternative E would limit the park's ability to present the eight themes and display the artifacts in a thought-provoking way. The reduced boat access to the Island and Glasshouse Point, and the indirect bike/hike trail access would result in a disjointed visitor experience. This alternative would have a moderate impact on the overall visitor experience. The new facilities would potentially increase visitor satisfaction with services and facilities by 1 to 2% (98 to 99%). It could enhance visitor understanding of the significance of the resources to 85%.

4.6 IMPACTS TO OPERATIONS

APVA and Colonial NHP staff provided an overview of their administrative history and current operations as they relate to the Jamestown Island area in order to determine the impacts of each of the Jamestown Project alternatives.

4.6.1 Methodology and Assumptions

Currently, Colonial NHP is understaffed and provides the minimum level of service. The park has 88 Full Time Equivalencies (FTEs), down from 125 FTEs in 1981. It is assumed under all of the alternatives that the level of visitation would increase from present and historical levels simply from an increased awareness of the resource as the 2007 commemoration approaches. Additional employees and resources would be required under all of the action alternatives because of the new programs, facilities, and/or an increase in visitation. Assumptions made include that Visitor Center facilities would operate year round, eight hours per day; facilities at the Neck of Land, the Agricultural site, and boat tours would operate from early spring until late fall; and APVA personnel would not expand their role in the operation of the Visitor Center or with visitor transportation. It is also assumed that the existing division of responsibilities on the Island between the NPS and APVA would continue unless specifically noted in the impact below. Each operational section used a cost per unit model for forecasting operating costs. The cost model was flexible for each division.

Under all of the alternatives, the projected costs for personnel, utilities, and supplies/materials are based upon FY 2001 salary figures and dollars; cost of living increases and inflation costs are not reflected in the figures.

4.6.1.1 NPS Maintenance

The maintenance division is currently operating with only 58% of its positions filled, resulting in a decreased level of maintenance for all Colonial NHP

resources. NPS staff reviewed previous year reports to obtain the average FTEs necessary to maintain the new building resources at the same level. To obtain this figure, the current number of FTE hours available for building maintenance was divided by the park's total building square footage. This figure was then used to calculate the FTEs required to maintain the new square footage under each alternative. It was assumed that the NPS would not maintain vehicles, boats, and bicycles used as alternative transportation and that the NPS would not maintain the APVA Collections/Research Facility, APVA Collections Building, or the Ludwell exhibit facility.

4.6.1.2 NPS Administration

Colonial NHP's staff calculated a ratio for administrative positions in the park based upon the number of FTEs assigned to NPS Jamestown. Other parks in the Virginia Sub-Cluster were analyzed to arrive at a ratio of 0.10 administrative employees needed for each 1 FTE. The assumption was also made that under each alternative, except Alternative A, NPS Jamestown would need more personnel, additional contracts, more variety of funding sources, expanded computer technology, and increased number of concession facilities providing food, refreshments, bus shuttle service, bicycle rental, and boat tours.

4.6.1.3 Resource and Visitor Protection

Under all of the alternatives it is assumed the level of visitation would increase. This would result in additional calls for law enforcement services, assistance to visitors, emergency response for medical incidents, accidents, wild land fires, and searches and rescues. The new facilities would require 24 hour per day patrol and emergency response coverage. Additional visitation and development would also require close monitoring of the Island's natural and cultural resources, as inadequate resource protection is currently occurring due to staff shortages. This would be most important during the construction period and the 2007 commemoration activities.

4.6.1.4 Historical Interpretation and Preservation

The current organizational structure would remain the same for this division. The NPS archaeologist, in addition to overseeing archaeological projects throughout Colonial NHP, would work as a partner with the Jamestown Rediscovery™ Project director on joint projects. This assumption does not reflect the proposed base increases for NPS Jamestown scheduled in FY2002, which would provide an Education Specialist, a Museum Technician, a park Historian and two Park Guides.

4.6.1.5 Impact Intensities

APVA and NPS staff reviewed the operational needs at Jamestown for each alternative. With the exception of Alternative A, all of the alternatives would require additional funds and personnel. The impacts from each alternative could be beneficial or adverse. For example, under an alternative, the park could request 25 FTEs and \$2,113,355 in additional funds for park operations. This would be a major impact on park operations but would result in beneficial impacts to operational efficiency, resource protection, and visitor experience. The impact indicators developed for this project are:

Negligible: An action would have no measurable impact to operations at Jamestown.

Minor: Actions with minor impacts would affect APVA/NPS operations in a way that would prove extremely difficult to measure. To the normal observer, such impacts would not be apparent. This would involve levels of increase in APVA and/or NPS budgets and current staffing of less than 10%.

Moderate: Actions with moderate impacts would measurably affect APVA/NPS operations. This would involve levels of increase in APVA and/or NPS budgets and personnel between 10-30%. Impacts would include providing additional visitor services, protection and emergency response services, facility maintenance, administrative support, and curatorial services.

Major: Actions would significantly affect APVA/NPS operations. This would involve levels of increase in the APVA and/or NPS budgets and personnel of greater than 30%. Impacts would include providing additional visitor services, protection and emergency response services, facility maintenance, administrative support, and curatorial services.

4.6.2 Effects of Alternative A (No Action)

For the APVA and NPS, annual operating costs for Alternative A would be \$9,770,894. Specific impacts are discussed below for each organization.

4.6.2.1 NPS

The decision to take no action would have a minor impact on park operations. With the projected increase in visitation during 2007, all of NPS Jamestown's operations would be required to handle the increased demands for service from the visitors. The park staff has been steadily declining over the past twenty years, down 37 FTEs, and at the current level they provide minimum service. The ability to protect resources and visitors and to provide a high quality experience would be adversely impacted. With the current staffing levels of all divisions, the No Action Alternative would result in a drastic reduction of maintenance, protection, and interpretation of critical resources.

Maintenance

The *Comprehensive Transportation Plan for Jamestown 2007*, states "a projected visitation level of approximately 648,300 persons be assumed at Jamestown Island in 2007." In 2000, visitation was 378,960 visitors. With this level of increased visitation, operations at both the Jamestown and Yorktown Units would experience adverse impacts under the No Action Alternative. The required level of custodial services and routine and conservation maintenance would increase proportionally to the number of visitors. The No Action Alternative would impact the maintenance operation, causing a

decrease in the level of maintenance available for the New Towne landscape, Glasshouse Ruins, the Green Spring Plantation site, and for interpretive devices such as audio boxes and wayside exhibits on the tour road. With anticipated increases in Yorktown visitation, the Yorktown maintenance staff would not be able to supplement the Jamestown operation during this period.

Administration

The administration division would continue to operate at its current level. Colonial NHP's base operating program, personnel management issues, and reliance on computer technology continues to grow each year. As the government continues to downsize and change its way of doing business, the role of the administrative division could become more complex. Increasing visitation and the decision to take no action would cause adverse administrative impacts.

Resource and Visitor Protection

As outlined above, with projected increases in visitation the calls for law enforcement and emergency assistance would increase and the higher number of visitors would compound threats to resources. The No Action Alternative would therefore adversely impact resource and visitor protection.

Historical Interpretation and Preservation

The No Action Alternative would result in adverse impacts to interpretation and preservation. The increasing number of visitors leading to the 2007 commemoration would overwhelm the park's ability to provide a quality interpretive experience to the public. Existing facilities and programs would not provide a satisfactory interpretive experience. Furthermore, knowledge obtained from recent excavations would not be available to visitors or researchers, and collections would remain threatened by flooding. Finally, natural resources would be threatened by increased visitation.

4.6.2.2 APVA

For the APVA, there would be a negligible impact on the level of staffing and operations at Jamestown from the No Action Alternative. The three divisions—archaeological research, visitor services, and maintenance—would continue to provide services at the current level of operation. Archaeological research is planned as an ongoing activity. Current visitor services include guides and interpreters to assist visitors in understanding the resource, museum store operations, and a food service operation. Maintenance includes grounds, trash removal, and general and specialized maintenance to the historic and service buildings on the property.

4.6.3 Impacts Common to the Action Alternatives

Impacts common to the action alternatives include the increased visitation to Jamestown Island and the need for additional staff and resources. The action alternatives would require maintenance of new facilities, expanded interpretive programming and research, additional monitoring of impacts to sensitive natural and cultural resources, administrative support to park staff, and additional law enforcement services to the public. All of the alternatives would involve increased use of computer technology both by the visitors at interpretive displays and by employees, thereby requiring purchase and maintenance of additional equipment. Additional visitor services would be provided by concessionaires, including food and refreshments, bicycle rental, and boat tours.

Under each alternative, the success of the Jamestown Project plans and programs would hinge on how successful the "new" Jamestown is communicated and marketed to potential visitors. All of the alternatives, with the exception of Alternative D, include adding a GS-7 Public Affairs Officer. The new facilities and programs would create a significant increase in media attention, access, and requests for information.

The curation and on-site storage of APVA artifacts remains a priority and is unchanged in all alternatives. The level of staffing for this activity and the Jamestown Rediscovery™ Center remains constant. The APVA would construct an interpretive building behind the Ludwell site, so additional staffing would be needed for this facility. The APVA would also hire a volunteer service coordinator.

In addition, for all the action alternatives, plans for administration and operations at Jamestown would need to be prepared to keep Jamestown open to visitors during the construction period. This would impact not only visitor services, but also ongoing research activities and staff facilities. Temporary structures may need to be used during this period to minimize impacts and keep Jamestown running smoothly.

4.6.4 Effects of Alternative B

For the APVA and NPS, annual operating costs for Alternative B would be \$11,979,549. Specific impacts are discussed below for each organization.

4.6.4.1 NPS

Alternative B would result in new opportunities to contact visitors and provide an enhanced interpretive experience, thereby increasing visitor enjoyment and satisfaction at NPS Jamestown. The proposed new development on Jamestown Island and at Neck of Land would require a substantial increase in the park's staffing levels and base operating program. This alternative would result in a major impact to park operations. In order to implement this alternative the park would need an additional 25 FTEs and an operating increase of \$1,943,355. All areas of park operations would require an increase in FTEs and funding in order to provide the appropriate level of maintenance, administrative support, and interpretation and protection of the park's resources and visitors.

Maintenance

Alternative B adds facilities to the maintenance operation as follows: 55,000 square feet of building structure, 350 linear feet of boat docks, 2/3 mile of boardwalk along a 2 mile bicycle trail, 1/2 mile of connecting trails leading to boat docks, one observation deck, an Agricultural garden site with one water/sewer connected restroom, an additional parking lot, and an electronic gate. These additions would have a major impact on current maintenance operations. With the scope of planned building resources, it is calculated that an additional 5.5 FTEs would be needed to provide the same level of maintenance availability as is provided to current structures. This figure can be reduced to 2.6 FTEs to compensate for the fact that new construction would require less maintenance than the existing, older structures. These positions would be as follows: one WS-10 Maintenance Mechanic, one WG-5 Maintenance Worker, and 0.6 FTEs for a GS- 11 Facility Management Specialist for administrative support.

The addition of a bike trail, connecting trails to boat docks and observation decks, along with new facilities at the Neck of Land area would greatly increase the grounds work required in the Jamestown area. The increase in trail maintenance, trash removal, and mowing would be substantial. At least 2.4 additional FTEs would be needed for road, trail, and grounds maintenance in order to maintain the new resources without impacting the current operation. These positions would be: one WG-8 Maintenance Worker, one WG -5 Maintenance Worker, and 0.4 FTEs of a GS-11 Facility Management Specialist for administrative support.

To implement this alternative a total base operating increase of \$465,443 would be required to cover the costs of additional FTEs, necessary supplies and materials, and increased utility costs. A one time start up cost of \$158,800 would be needed to purchase vehicles and equipment necessary to support the new operation.

Administration

Based on the need to support a more complex park operation at Jamestown Island, the administrative division would need an additional 3 FTEs and a base operating increase of \$313,787. The increased number of employees in the park would cause extra workload for the personnel office in staffing, employee and labor relations, benefits administration, worker compensation, and other personnel related issues. A GS-9 Human Resources Specialist would be required to handle the increased workloads and demands.

The major increase in the park's base operating program and the larger variety of fund types associated with implementing this alternative would have a major impact on the park's ability to manage its budget. A GS-7 Purchasing Agent would be hired to handle purchasing, and the current part-time Budget Analyst position would be upgraded to a GS-12 and made full time. The Administrative Officer would be upgraded to a GS-13.

The increase in concession-operated facilities providing visitor services would require the addition of a GS-12 Concession Specialist. In addition to monitoring the current concession operations, the position would be responsible for concession management of the new facilities in the Jamestown Island area, including food services, boat tours, transportation systems, and bike rentals. The proposed expansion of interpretive facilities with computer and advanced technological exhibits would require the park to contract for full time computer service.

Resource and Visitor Protection

This alternative would add the most development to the Jamestown Project area. The new facilities, the increase in visitation, and the potential impact to resources would require the protection staff to allocate more time to patrolling the area, investigating crimes and accidents, assisting visitors, responding to building alarms, and providing increased emergency services for injured persons,

searches and rescues, and wild land fire incidents. This alternative would necessitate designating the Jamestown area one of three primary patrol sectors, the other two being the Colonial Parkway and the Yorktown Battlefield, and assigning rangers to concentrate their patrol activities in the area. The increased protection operation would need three additional FTEs including two GS-9 Park Rangers (Protection) and one GS- 5 Telecommunications Operator.

The increased development and visitation under this alternative would also impact natural resources. The park would need to increase its capabilities to inventory, monitor, and conduct research in order to adequately protect the natural resources and determine any trends or potential impacts. To accomplish this task, the park would need an additional FTE for a GS-9/11 Biologist and funding for contracted research and monitoring. Personnel costs would be \$239,914 a year; one time equipment costs would be \$125,000. Ongoing contracting and supplies/material costs would be \$40,000 a year.

Historical Interpretation and Preservation

This alternative would greatly expand the interpretive operation at Jamestown. The new Visitor Center would rely on the current staff. The Jamestown District Supervisor would also direct the efforts of the new facilities at the Neck of Land facility, the Observation Building, and the Interpretive Anchor at the Agricultural demonstration area. The Neck of Land Intermodal Transportation Terminal would require a staff of 2 FTEs. At the Observation Building, a staff of 2 FTEs would be required to provide assistance to the visitors in touring the structure and relating it to the site. The Agricultural site would provide a unique living history experience requiring a staff of 2 FTEs trained in living history demonstration techniques and costuming. Specialized equipment and tools would be utilized to make this activity effective. It would enable the park to relate many of the untold stories associated with Jamestown and the early settlers, especially women and African-Americans.

Additional staffing to accomplish the above actions would involve two GS-9 Park Rangers and seven GS-5 Park Guides.

With the closing of the entrance station, the fee collection staff would continue their duties at the Visitor Center. A GS-11 Fee Coordinator would oversee Jamestown's fee program, which would expand dramatically with the numerous types of joint tickets with other partners. The expanded Jamestown Rediscovery™ Center would utilize the current curatorial staff but would require an additional GS-7 Museum Technician and a GS-11 Archivist position jointly funded by APVA to oversee the expanding collection and providing access to the collection to numerous researchers. The staff would also assist with developing new exhibits. Total operating costs for this alternative would be \$550,411.

4.6.4.2 APVA

This alternative would have a moderate impact on operations resulting from an increased level of activity and consequent operational costs to the APVA. The APVA has been able to recruit sufficient numbers of volunteers to date and believes the program could be expanded to provide visitor assistance. The expected increase in visitation should offset the elevated costs.

4.6.5 Effects of Alternative C

For the APVA and NPS, annual operating costs for Alternative C would be \$12,692,657. Specific impacts are discussed below for each organization.

4.6.5.1 NPS

This alternative would have a major impact on park operations, and the impacts to park operations would be similar to those outlined in Alternative B. The distance from the main interpretive facilities at the Neck of Land location to the actual site at Jamestown Island would create difficulties in supervising staff as well as providing support to

visitors and staff alike. The separate locations for the APVA and NPS collections would impact the ability of researchers and the public to view the collections at a single site.

Maintenance

Alternative C requires adding approximately 51,000 square feet of building structure (4,000 square feet less than Alternative B), 350 linear feet of boat docks, 2 miles of hike/bike path, 1/2 mile of connecting trails leading to boat docks, one observation deck, an Agricultural garden site with water/sewer restrooms, an additional parking lot, and an electronic gate. The addition of these structures would have a major impact on the current maintenance operation. The type of positions needed and the total base increase requested are the same as listed for Alternative B.

Administration

The impacts to the administration division are the same as outlined in Alternative B.

Resource and Visitor Protection

This alternative is similar to Alternative B with the exception of moving the primary visitor facilities to the Neck of Land area. The impacts to the protection operation are the same, with the exception that the increased development at Neck of Land may require additional monitoring of impacts to water quality from runoff of a larger parking lot and impacts to wetlands and wildlife. Type of positions needed and total operating cost increases are the same as outlined in Alternative B.

Historical Interpretation and Preservation

The type of positions and the base operating cost increases for this alternative would be the same as outlined under Alternative B.

4.6.5.2 APVA

Impacts to APVA operations would be the same as those described under Alternative B. The overall impact would be moderate, and the volunteer program would be expanded.

4.6.6 Effects of Alternative D

For the APVA and NPS, annual operating costs for Alternative D would be \$11,010,012. Specific impacts are discussed below for each organization.

4.6.6.1 NPS

Alternative D has moderate impacts to park operations and the least impacts of the action alternatives. It proposes no new development at Neck of Land. The hike/bicycle trail would be on-grade, and the only major changes would be an expansion of the current Visitor Center. The primary impacts would be from increased visitation to Jamestown, the enhancements to the Agricultural site, the 7,000 square feet of additional facilities at the Visitor Center, and the increasing costs of maintaining aging infrastructure. The park is requesting an additional 13 FTEs and a base operating increase of \$1,143,818.

Maintenance

Alternative D requires reconfiguring the existing Jamestown Visitor Center and adding approximately 7,000 square feet in a third floor addition. With visitation expected to exceed 648,000, the grounds work, especially trash removal, would necessitate increasing the staff base by at least 3 FTEs in order to handle operations without adversely affecting resources. The positions are two WG-5 Maintenance Workers and one WG-8 Maintenance Worker. In addition, one full time GS-11 Exhibit Specialist would be required to maintain the exhibits without adversely affecting operations in the Yorktown Unit. With anticipated increase in workload created by both increased visitation and aging assets, one WG-10 Maintenance Mechanic would be necessary. The additional custodial services require one WG-5 Maintenance Worker. A total base increase for maintenance would be \$412,707 to cover the costs of the additional FTEs, supplies and materials, and increased annual utility cost. A one time start up cost of \$139,800 would be needed to purchase vehicles and equipment necessary to support the operation.

Administration

Based upon the need to support additional staff and to properly manage the increased budget of the park, the administrative division would need an additional 2 FTEs. A GS-9 Human Resources Specialist would be needed to manage the extra personnel work associated with the additional employees required by this alternative. As in Alternative B, the current part-time budget analyst would be made full time, and a GS-1 Purchasing Agent would be required.

Furthermore, the park would need a full time computer service contract to handle the increased technological demands associated with this alternative. The division would need an additional \$230,200 in base operating funds.

Resource and Visitor Protection

Although this alternative would not add any new facilities and/or trails, the ranger staff would have to provide the full range of law enforcement, resource protection, emergency response, and visitor assistance services to an increased number of visitors. In order to handle the increased visitation and the resulting calls for service, the protection division would need an additional two GS-9 Park Rangers - Protection. This would require a base increase of \$133,500 a year and a one-time start up cost of \$62,400.

Historical Interpretation and Preservation

The current staff assigned to the Jamestown Visitor Center and the curatorial operations would continue existing operations. This includes guided walking tours and special programs focusing on Jamestown's history and resources. The new Agricultural demonstration site would provide a unique living history experience. A staff of two employees trained in living history demonstration techniques would be required on a daily basis. A staff of one GS-9 Park Ranger and one GS-5 Park Guide would also be necessary. The entrance station would continue to function at its current location. A GS-11 Fee Coordinator would be needed to manage the program

because of the numerous joint ticketing proposals with other area attractions and the increase in collection of fees from higher visitation. The curatorial operations would continue to provide assistance to researchers only on the NPS collection and would not be able to provide analytical analysis between the NPS portion of the Jamestown collection and that of the APVA. This would require a base increase of \$165,244.

4.6.6.2 APVA

Alternative D would require no alteration to either the Jamestown Rediscovery™ Center or the Dale House and would have a minor impact to APVA operations. The only change would be the addition of the interpretive anchor building at the Ludwell exhibit site.

4.6.7 Effects of Alternative E

For the APVA and NPS, annual operating costs for Alternative E would be \$11,979,549. Specific impacts are discussed below for each organization.

Alternative E would have major impacts to park operations. The proposed development for Alternative E is very similar to the development outlined in Alternative B, and the impacts to park operations would be the same as outlined in Alternative B. The impacts to APVA operations would be the same as outlined under Alternative B.

4.6.8 Cumulative Impacts

Each of the action alternatives would have cumulative beneficial impacts to park operations, assuming staffing levels were adequate for the additional demands. New and renovated structures would require less building maintenance, allowing staff to concentrate on other responsibilities. Technological improvements would assist in administration and interpretation. Finally, improved orientation facilities would lessen the burden on staff to re-orient confused visitors.

4.6.9 Conclusion

The impacts to park operations under Alternatives B, C, and E are the same and involve major impacts to operations. The increased visitation to the Jamestown area and the development at Neck of Land and on the Island would result in major impacts to park operations. All phases of the park's operation would need substantial increases in both staff and funding in order to accomplish the park mission under Alternatives B, C, and E.

Alternative D would have a moderate impact on operations but would still require additional staff and funding, though about half of the increases required under the other action alternatives. If the park does not receive adequate funding under the selected alternative, an adverse impact would result, which could cause increased adverse impacts to existing resources. All of the alternatives would provide new opportunities to contact visitors and provide an enhanced interpretive experience.

Table 4-21 provides a summary of NPS operational staffing requirements for each alternative.

4.7 IMPACTS TO BUILDINGS AND UTILITIES

4.7.1 Methodology and Assumptions

This section identifies impacts of each design alternative on utility infrastructure. Impact thresholds were not evaluated for impacts to buildings and utilities because improvements to utilities are necessary to bring structures and infrastructure up to standards and meet specified codes, and utility systems would be upgraded, as necessary, to accommodate improvements. In addition, the impacts to natural and cultural resources of installing new utility lines and piping have been specifically addressed within the individual resource sections of this chapter.

Table 4-21: Operations Staffing Requirements (NPS)

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Maintenance	Current staffing level provides the minimum level of service.	3 maintenance workers	3 maintenance workers	4 maintenance workers	3 maintenance workers
		Exhibit specialist	Exhibit specialist	Exhibit specialist	Exhibit specialist
		Maintenance mechanic	Maintenance mechanic	Maintenance mechanic	Maintenance mechanic
		2 facility management specialists	2 facility management specialists		2 facility management specialists
Administration	Current staffing level provides the minimum level of service.	Human resource specialist	Human resource specialist	Human resource specialist	Human resource specialist
		Budget analyst	Budget analyst	Budget analyst	Budget analyst
		Purchasing agent	Purchasing agent	Purchasing agent	Purchasing agent
		Administrative officer	Administrative officer		Administrative officer
		Concession specialist	Concession specialist		Concession specialist
Resource and Visitor Protection	Current staffing level provides the minimum level of service.	2 park rangers (protection)	2 park rangers (protection)	2 park rangers (protection)	2 park rangers (protection)
		Telecommunications operator	Telecommunications operator		Telecommunications operator
		Biologist	Biologist		Biologist
Historical Interpretation and Preservation	Current staffing level provides the minimum level of service.	3 park rangers	3 park rangers	Park ranger	3 park rangers
		7 park guides	7 park guides	Park guide	7 park guides
		Fee coordinator	Fee coordinator	Fee coordinator	Fee coordinator
		Museum technician	Museum technician		Museum technician
		Archivist	Archivist		Archivist

4.7.2 Effects of Alternative A (No Action)

Under the No Action Alternative, no improvements are proposed to the existing utility systems on the NPS property. In the short-term, this alternative would benefit from a lack of associated construction costs and continuation of current maintenance schedules and costs. However, existing problems, which are detailed below, have been identified by the APVA, NPS, and

other sources. These problems would remain as a result of the No Action Alternative and, in many cases, would grow more severe with time:

Sanitary Sewer

The existing force main that runs through the marsh between the Visitor Center and its parking area is old and may eventually fail. The three sanitary drain fields located on the APVA property are also aging and at risk of failure. The grinder-

ejector pump and 1 ½-inch force main that serves the Comfort Station restrooms is difficult to maintain, a problem that would continue under the No Action Alternative. The APVA property would be connected to public sewer, as described under “Impacts Common to the Action Alternatives.”

Water

The existing Glasshouse fire hydrant is located approximately 600 feet from the ruins and Glasshouse building, a substantial distance when needed for fighting fire. Additional fire hydrants are warranted to protect the Glasshouse, Jamestown Rediscovery™ Center, Godspeed Cottage, and Dale House but would not be added under the Alternative A: however, the APVA property would be connected to public water, as described under “Impacts Common to the Action Alternatives.”

Electrical Service

The power line along the Isthmus has been spliced many times (Virginia Power personal communication 2001) and contributes to the frequent power outages on Jamestown Island. Power outages would be expected to continue under this alternative, as emergency generators for backup power supply are not available.

Telephone

The existing telephone system does not take advantage of state-of-the-art telephone technology and has limited expansion potential; this would not be updated under the No Action Alternative.

Stormwater

Stormwater piping, culverts, catch basins, and outfalls are not designed to current standards, and as a result, there are many areas that do not drain well or hold water for long periods of time.

Natural Gas

There is currently no natural gas service to the Island; however, a 2-inch gas line serves the Glasshouse area. Under this alternative, no service would be added to the Island.

In general, this alternative would not accommodate the expected increase of visitors over the next decade, and inadequate utility service would likely become problematic before or during the 2007 anniversary year. Insufficient amenities, such as public restrooms and parking, may discourage tourists from visiting the park or returning for future visits. Overuse of the existing facilities would create a greater likelihood of failure and a need for increased maintenance.

4.7.3 Impacts Common to the Action Alternatives

4.7.3.1 Townsite Area

Stormwater

New stormwater collection systems would generally utilize small flexible pipe systems discharged at various outfalls in order to redirect flows away from pedestrian paths. Numerous systems or drainage features, including drain inlets, flumes, and swales, would be required. The existing stormwater systems could be retained and maintained, however, some local flooding of pathways and erosion might occasionally occur.

Pedestrian Footbridge Replacement

The existing pedestrian footbridge connecting the parking area to the Visitor Center would be removed. The following utilities would be impacted by its removal:

Sanitary Sewer

The exiting 1 ½-inch force main would be removed.

Electrical Service

Approximately 700 feet of electrical line in conduit would be removed.

These utilities would be removed once a new 700-foot bridge is extended between the Island parking lot and the historic Townsite. Replacement utilities would follow the alignment of the new bridge.

APVA Property Connections to Public Utilities

Each alternative (including the No Action Alternative) would include the underground extension of a water main and sewer line to the Jamestown Rediscovery™ Center and the remainder of the APVA property. By regulation, the water main must always remain a minimum of 10 feet from the sewer line. This would require the trenching of two separate corridors, one for each line. Trenching would be done with a small backhoe using a ±1-foot wide bucket at a depth of approximately four feet. The extensions would begin at a connecting point with the existing lines immediately adjacent to the Colonial Parkway entrance to the Jamestown Island parking lot. This work would encroach into the RPA near the beginning of the APVA service road, north of the Pitch and Tar Swamp. It is expected, however, that the lines would be installed within the existing service road right-of-way once within the RPA, such that vegetation removal would be minimized. As the service road turns southward to cross the Pitch and Tar Swamp, so would the utility lines. One line would be on the extreme western side of the road, and the other line would be located on the extreme eastern shoulder of the road in order to maintain the 10-foot wide separation.

The proposed parking area expansion would disturb the existing sanitary drain field north of the Jamestown Rediscovery™ Center. A grinder-ejector pump and sanitary force main would be required, as restoring or relocating a drain field in this area is not a viable option. Once the connection to public water and sewer is complete, the sanitary drain field would be removed.

4.7.4 Effects of Alternative B

Alternative B proposes construction in all areas of Jamestown. For descriptive purposes, the Jamestown project site is separated into the following three areas:

- Townsite, including the areas around the Comfort Station, pedestrian bridge, Ludwell exhibit facility, and Observation Building;
- Colonial Parkway; and
- Neck of Land.

4.7.4.1 Townsite

Comfort Station

Removal of the existing Comfort Station restrooms would require all existing utilities to the building, including sanitary sewer, water, and electrical power, to be disconnected and secured. In order to minimize impacts to the physical landscape, these utilities would be secured in place and would not be removed.

Observation Building

Due to the removal of the existing pedestrian bridge and associated utilities, new water and sewer infrastructure would connect to the Observation Building.

Sanitary Sewer

Approximately 1,300 feet of new sanitary force main (6-inch typical) would be constructed crossing the new pedestrian bridge to the Observation Building. The existing 6-inch sanitary force main that lies in the marsh area would be capped at both ends, filled with flowable fill, and abandoned in place so that wetland areas are not disturbed. A new 6-inch force main would be constructed to ensure long-term reliability of the system.

Low impact restrooms with no-flush toilets were considered but are not suitable for this application.

Water

A 4-inch fire and 4-inch domestic water line would be extended approximately 1,300 feet to the Observation Building. Domestic water taps would be required for a 1 ½-inch line to the Observation Building and 1-inch lines to the Yeardley House, Godspeed Cottage, and Dale House.

Electrical Service

The electrical service panel and transformer would have to be upgraded (Dominion Virginia Power personal communication 2001) in order to accommodate additional loads. Dominion Virginia Power may provide and install the transformer, depending on estimated power use; however, the NPS must provide and install the new electrical panel.

Telephone

Telephone service upgrades, including fiber optic capability, are proposed in this alternative. According to Verizon personnel, there would be no costs associated with upgrades as long as the main 100-pair copper cable serving this area does not have to be replaced and the estimated use is sufficient to warrant the upgrades.

Replacement Visitor Center/Educational Facility

Construction of the replacement Visitor Center/Educational Facility would require new utility connections to the building from existing utility infrastructure.

Sanitary Sewer

A submersible pump station, or grinder-ejector pump, would be connected to the building from an existing 6-inch force main approximately 350 feet away and located in the Visitor Center parking lot. This alternative would also require disconnecting and removing approximately 350 feet of existing 6-inch sanitary force main crossing the new building footprint.

Water

Separate connections for fire and domestic water would be made from the Visitor Center parking lot side (northeast side). Water service (and sanitary sewer) would be routed around the building to the Observation Building.

Electrical Service

Electrical lines and a transformer to the building would be required.

Telephone

Telephone service to the building is proposed. Fiber optic capability can be provided as part of the improvements; however, a room approximately 5 feet by 8 feet would be needed for telephone panels and equipment. The nearest fiber optic cable is approximately 6,000 feet from the proposed structure.

Stormwater

Increased stormwater runoff would result from the new building. Stormwater systems for accommodating runoff would likely consist of grass swales, small underground flexible pipes, and marsh ponds for water quality control. There is insufficient slope in this area to construct typical stormwater piping systems.

4.7.4.2 Colonial Parkway

Parkway Improvements

New swales would be constructed along the Parkway between the Maintenance Yard and Powhatan Creek to match the existing contours and minimize cut and fill along both sides of approximately 1,000 feet of Parkway improvements. This would maximize the water quality efficiency of the roadside ditches while ensuring positive drainage. In order to make improvements to the existing culvert and ditch systems in this area, downstream channel adequacy calculations would be required.

4.7.4.3 Neck of Land

Intermodal Transportation Terminal

Sanitary Sewer

Sanitary sewer is proposed for the area and would likely require a submersible pump station with approximately 2,000 feet of 8-inch sanitary force main connecting the facility to an existing manhole at the Maintenance Yard. The manhole would require modification or replacement to accept a new 8-inch force main and a new gravity pipe. The

existing sanitary line to JCSA lift station 5-1 would have to be replaced with a larger pipe to accommodate the additional flows. JCSA reports that the lift station has the capacity for the additional proposed flows; however, analysis would be required to verify that peak demands would not surcharge system or exceed pump capacity. A sanitary crossing under the Parkway could be jack-and-bored without disrupting the pavement or traffic.

Water

Service for fire and domestic water can be extended from the Maintenance Yard approximately 2,000 feet to the facility. There would be a crossing under the Parkway that can be jack-and-bored to the south side without disrupting the pavement or traffic.

Electrical Service

Existing electrical service, located on the north side of the Parkway, can be extended overhead or underground approximately 1,200 feet to the new facility. Virginia Power would determine the additional cost for direct burial versus overhead line installation.

Telephone

The existing telephone line for the area is a 50-pair cable, which may require upgrading to a larger capacity depending on the number of phones installed at the new facility. Connection to the existing telephone line would require up to 3,000 feet of new cable. Underground cable is more expensive but would be less intrusive and more reliable than overhead service.

Stormwater

Proposed parking in the Neck of Land area would require additional stormwater management, which would consist of pervious parking areas, grassed swales, low profile earth berms, and bio-retention areas. Approximately 6 acres of wooded area would be cleared for the proposed parking area and stormwater utility improvements.

Boardwalk Improvements

Electrical Service

The proposed boardwalk crossing in the Neck of Land area would require electrical service, which would be connected from the Neck of Land parking side (2,300 feet). This would serve as the new “loop” through Jamestown Island.

Conduits and duct banks would be installed so that the electrical system could be expanded to a looped system in the future. Looping the system would improve service reliability to the area.

4.7.5 Effects of Alternative C

Alternative C also proposes construction in all areas of Jamestown and includes the following impacts in addition to those described for Alternative B.

4.7.5.1 Townsite

New Restrooms

The new restrooms would be located near the Agricultural exhibit in the southeastern corner of the site and would require full utility service.

Sanitary Sewer

A grinder-ejector pump would be required for discharging effluent approximately 1,500 feet to JCSA pump station 2-3. The sanitary force main system would require maintenance by the National Park Service.

Water

Approximately 1,500 feet of 2-inch waterline would be installed along a path to the restrooms.

Electrical Service

A direct burial line to the restrooms would provide power to the grinder-ejector pump, lighting, and ventilation systems.

Telephone

Telephone service at the proposed building would be connected in the vicinity of the Visitor Center.

Observation Building

Impacts associated with improvements to the Observation Building are the same as in Alternative B, except that JCSA pump station 2-3 would remain in service for the new restrooms near the Agricultural exhibit area.

Replacement Visitor Center/Educational Facility

Sanitary Sewer

The Observation Building would require a submersible pump station and about 100 feet of force main (4-inch typical). The existing 6-inch sanitary force main located under the existing Visitor Center parking could be abandoned in place.

Water

Approximately 100-feet of domestic and fire protection water lines would be extended. The existing water lines located in the Visitor Center parking area would be adequate for the new facility, according to JCSA.

Electrical Service

The pump station would require new 3-phase power from the existing electric service located 300 feet north of the APVA access road.

Telephone

The existing telephone service lines located in the Townsite area would be adequate, according to Verizon, if connection to this facility is desired.

4.7.5.2 Colonial Parkway

Electrical Service

Improvements to the Parkway, about 900 feet east of the Powhatan Creek Bridge, would require some rerouting of electrical lines in order to avoid covering existing lines with new concrete pavement. The total length of relocated power lines would be approximately 1,500 feet.

Stormwater

Disturbance in these areas during construction would require temporary stormwater management and sediment control.

4.7.5.3 Neck of Land

Intermodal Transportation Terminal

Impacts of this proposed building are the same as in Alternative B.

Parking Area

The proposed improvements would result in significant land disturbance and stormwater runoff. There would be more clearing, cut, and fill for this alternative than in all other alternatives. Approximately 7 acres of wooded area would be cleared for the proposed parking area. Six to ten drainage structures, including grassed swales and ditches, would be required to handle the runoff.

4.7.6 Effects of Alternative D

Proposed utility improvements would be the same as those for Alternative B; therefore, the same impacts would result, except as indicated below.

4.7.6.1 Townsite

Observation Building

Sanitary Sewer

The location of the new bridge, east of the existing bridge, would allow the 6-inch sanitary force main to remain in service.

Water

New fire and domestic water lines could be incorporated into the footbridge construction. Because of the location of the bridge in this alternative, if the water lines are not buried but instead are constructed along the bridge, then the length of each line would be approximately 500 feet shorter than the 1,300-foot extension required in Alternatives B, C, and E.

Electrical Service

Electric lines would be extended to the bridge for bridge lighting.

Stormwater

The proposed bridge location is near two exiting stormwater outfall pipes, which are located on each side of the existing marsh area. Placement of the bridge support columns would require rerouting or modification of the outfall pipes.

4.7.7 Effects of Alternative E

The utility impacts associated with this alternative would be similar to those associated with Alternative B, with the following exceptions.

4.7.7.1 Townsite Area

Low Impact Restrooms

As an alternative to standard restroom construction, low impact restrooms offer an environmentally sensitive facility. Low impact restrooms minimize water use, wastewater and electrical power. However, they would not be practical for this application because of the cost, utility requirements, structural issues due to the proximity to the floodplain, number of visitors, and expected health department issues.

Observation Building

Low impact restrooms were considered for this building; however, due to high costs associated with the restroom and building modifications, they would not be feasible for this project.

4.7.7.2 Neck of Land Area

The impacts would be the same as in Alternative B.

4.7.8 Cumulative Impacts

All of the action alternatives would impact the utility infrastructure at Jamestown. Taken together, the improvements required under each alternative

would cumulatively result in a comprehensive and modern system of water/sewer, stormwater, electrical, and communications infrastructure. In addition to serving the utility needs of specific improvements, the development of a more complete system would be a positive cumulative impact.

4.7.9 Conclusion

Each of the action alternatives would require improvements to the utility infrastructure at Jamestown. Although there would be costs associated with the improvements, the overall impact to the system would be beneficial, as future demands would be adequately served.

4.8 IMPACTS TO TRANSPORTATION AND SITE ACCESS

The development of the Jamestown project would increase the attractiveness of Jamestown Island as a destination; therefore, the intensity of transportation activities at the site and on adjacent transportation facilities is expected to increase. This section focuses on the identification of how the proposed alternatives are likely to change transportation to and from the site, potential transportation impacts to the existing transportation infrastructure, and, if needed, the identification of potential mitigating measures.

4.8.1 Future Planned Transportation Improvements

4.8.1.1 Route 359 Realignment

The realignment of Route 359 is planned by the Commonwealth of Virginia to move this roadway away from the front door of the Jamestown Settlement. The purpose for this realignment is to improve visitor safety. Currently, Route 359 divides the Settlement from the visitor parking lot. At peak season over 1,000 pedestrians per hour, many of whom are children, use the connecting pedestrian crosswalk between the parking lot and the Settlement Visitor Center.

From its intersection with the Colonial Parkway, Route 359 would be relocated to the north to avoid the parking lot. Route 359 would then intersect with Route 31 approximately 1,200 feet north of its current intersection. The Jamestown-Yorktown Foundation supports this project. James City County, the APVA, and the NPS are all opposed to the existing alignment of Route 359 and have requested that a master plan be conducted to evaluate alternate design concepts or design modifications. Some of these proposals include:

- Realignment of Route 359 to intersect further north onto Route 31 directly opposite a realigned Greenspring Road (Route 614),
- Provision of a 50-foot wide landscaped buffer,
- Incorporation of Jamestown Road frontage roads,
- Connection with Greenspring Road (Route 614), and
- Connections to adjacent property owner parcels, including the marina.

Recent coordination between the above agencies has resulted in a potential change in design for Route 359 that provides a more direct link with the Colonial Parkway. The proposed roadway alignment shift, however, would require improvements on NPS property to make an intersection connection with the Colonial Parkway. An Environmental Assessment was conducted to evaluate the impacts of this proposed design modification, and a Finding of No Significant Impact (FONSI) was signed in July 2002. Construction should begin in 2003.

4.8.1.2 Colonial Parkway Shuttle Service

A Colonial Parkway shuttle has been proposed by Colonial NHP to eventually operate along the Colonial Parkway connecting Jamestown Island with Colonial Williamsburg and Yorktown. The *Alternative Transportation Systems Study* (BRW and Cambridge Systematics 2001) estimated that this

transit service could provide access for 25% of peak season visitation. One-half hour headways are envisioned on this service with a total of 14 trips per day. For this study, it was assumed that the mode shift would occur from the auto mode only and that existing charter and school buses activities would continue. The resulting transit mode share by month assumed for the 2020 design year is shown below in Table 4-22.

4.8.1.3 Jamestown Settlement

Jamestown Settlement has been actively planning for the Jamestown 2007 commemoration and is expecting that visitation would increase at this facility as well. Based on 2010 projections presented in the *Jamestown 2007 Report*, a 2% annual growth trend in visitation was identified for the Jamestown Settlement. With this growth rate, the existing annual visitation is expected to increase from 512,613 to 761,720 by 2010. Estimates for the 2007 commemoration also anticipate approximately one million visitors per year. Based on previous event years, including the 1976 Bicentennial, the 2007 event is expected to increase visitation on the shoulder years of the event (2006 and 2008), but not significantly impact the overall growth trend at Jamestown Settlement.

4.8.1.4 Colonial Parkway Multi-Use Trail

Colonial NHP previously considered the creation of a multi-use trail along the Colonial Parkway. At this time, however, there are no definite plans or details for this potential bicycle and pedestrian enhancement due to potential adverse impacts on the Parkway and lack of funding. Currently, bicycles are allowed to travel on the Colonial Parkway.

4.8.2 Future Design Year Projections

Projecting transportation conditions on existing roadways is typically determined using average or prevailing growth traffic rates. The proposed completion date for the Jamestown Project is 2005. The year 2020 was selected as the design year for evaluating potential transportation impacts.

Table 4-22: Estimated 2020 Design Year Transit Mode Share to Jamestown Island with Colonial Parkway Shuttle

Month	Current Percent By Charter/School Bus	Forecast Percent By Shuttle	Forecast Percent By Auto	Total Mode Share
January	11.6%	22.1%	66.3%	100.0%
February	33.3%	16.7%	50.0%	100.0%
March	44.8%	13.8%	41.4%	100.0%
April	45.9%	13.5%	40.6%	100.0%
May	48.3%	12.9%	38.8%	100.0%
June	22.5%	19.4%	58.1%	100.0%
July	2.6%	24.4%	73.0%	100.0%
August	1.0%	24.8%	74.2%	100.0%
September	7.8%	23.1%	69.1%	100.0%
October	21.3%	19.7%	59.0%	100.0%
November	42.3%	14.4%	43.3%	100.0%
December	19.2%	20.2%	60.6%	100.0%
TOTALS	24.3%	18.9%	56.8%	100.0%

Note: Current bus vehicle mode split information obtained from the *Alternative Transportation Systems Study* (BRW and Cambridge Systematics 2001)

Table 4-23 summarizes annual visitation projections for the year 2020 using four alternative growth scenarios. The first assumes a low growth (1.9% growth in visitation per year) for the entire planning horizon, which is based on the national average trend of all NPS facilities. This estimate has been developed for Alternative A (No Action). The action alternatives also assume low growth through the year 2005, when new facilities are anticipated to be complete and in operation.

Between 2005 and 2020, differing growth rates were developed for each action alternative. For Alternatives B and C, a high growth rate (4.0% growth in visitation per year) projection was applied. This higher growth rate is based on recent short-term growth trends (1999-2000) and represents the added attractiveness of the actions being proposed at Jamestown. Alternatives D and E are projected to experience growth between the low and high growth projections, with Alternative E experiencing slightly higher growth than Alternative D.

Analyses in this section will focus on a peak season, design day condition. Based on a review of historical visitation data, the number of visitors expected during a peak design month was identified in the *Alternative Transportation Systems Study* as 12% of annual visitation. The peak design day was then identified as being composed of 3.3% of the peak design month. This results in a range of projected visitation from approximately 2,200 to 3,000 visitors per day.

In order to evaluate peak demands for both autos and buses, two peak conditions have been considered: 1) July, which is the peak month for overall visitation, and 2) May, which has the highest overall monthly visitation by the bus mode. For each month, the number of entering vehicles expected has been projected for a peak design day. Table 4-24 summarizes the mode share projections of the expected number of daily vehicles trips.

Table 4-23: Year 2020 Visitation Projections for Jamestown Island

Alternative	Average Annual Growth*	Annual Number of Visitors**	Peak Design Month	Peak Design Day
A (No Action)	1.9%	552,180	66,260	2,190
B and C	4.0%	749,800	89,980	2,970
D	2.9%	634,840	76,180	2,510
E	3.1%	661,270	79,350	2,620

* Average annual growth projections shown above were applied for the time period between 2005 and 2020. Prior to 2005, growth in visitation is projected to occur at 1.9% per year on Jamestown Island.

** Annual Visitation projections obtained from the *Alternative Transportation Systems Study*. Peak projections estimated using estimating guidelines provided in the *Alternative Transportation Systems Study*. Peak design month is assumed to be 12% of annual visitation. Peak design day is 3.3% of design month.

The July 2020 design day would generate from 528 to 717 entering autos. This is 16 to 58% greater than existing (2001) entering auto volumes (existing peak design day volumes of 455 entering autos per day).

The May 2020 design day would generate significantly fewer autos but from 25 to 34 charter or school buses per day. In addition, the proposed Colonial Parkway shuttle would require from 13 to 17 daily shuttle bus trips. Charter buses and school buses currently play a major role in bringing tour groups and school-age children to the site. This activity is likely to increase over time due to the significant increases in interpretative and

educational experiences at Jamestown Island, particularly with the action alternatives (B through E). As detailed previously in Table 4-22, the charter bus usage was assumed to maintain its modal share, even with the implementation of the proposed shuttle service.

Peak hour vehicle trip projections for Jamestown Island were prepared using traffic volume data collected at Jamestown Island on May 1, 2001. The hourly distribution of traffic volumes entering and exiting Jamestown Island, and the effects on parking accumulation were examined. For Alternative A, the current average visit of 1.7 hours was assumed.

Table 4-24: Year 2020 Daily Vehicle Trip Projections for Jamestown Island

	Alternatives			
	A	B and C	D	E
July – Worst Case for Auto Demand				
Entering Autos	528	717	607	632
Entering Charter/School Buses	2	2	2	2
Entering Shuttle Buses*	<u>13</u>	<u>17</u>	<u>14</u>	<u>15</u>
Total Vehicles	543	736	653	649
May – Worst Case for Bus Demand				
Entering Autos	195	265	224	233
Entering Charter/School Buses	25	34	29	30
Entering Shuttle Buses*	<u>13</u>	<u>17</u>	<u>14</u>	<u>15</u>
Total Vehicles	233	316	267	278

* Bus demand is shown for planned shuttle service at 25% mode share.

Based on the proposed additions to Jamestown Island in Alternatives B, C, D, and E, one hour was added to the average visit. With Alternatives B through E, vehicles would park for a longer period of time and this would have a significant impact on the number of parking spaces needed to accommodate projected demand. Parking accumulation charts were developed to simulate entering and exiting vehicles, and this method allowed for an evaluation of parking needs as well. Parking accumulation worksheets for each Alternative are provided in Appendix J.

Projected year 2020 peak hour traffic volumes entering and exiting Jamestown Island are summarized in Table 4-25. During the July peak design day, the Jamestown Island alternatives would generate between 171 and 240 peak hour two-way vehicle trips to and from the site. During the May design day, peak hour volumes would be significantly lower, ranging from 81 to 118 vehicle trips to and from the site. For both May and July conditions, the peak hour is projected to occur between 2 and 3 p.m.

Table 4-25: Year 2020 Peak Hour Vehicle Trip Projections for Jamestown Island

	Alternatives			
	A	B and C	D	E
July – Worst Case for Auto Demand				
<u>Entering Vehicles</u>				
Autos	82	112	94	98
Charter Buses	0	0	0	0
Shuttle Buses	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>
Total Entering Vehicles	84	114	96	100
<u>Exiting Vehicles</u>				
Autos	84	123	103	108
Charter Buses	1	1	1	1
Shuttle Buses	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>
Total Exiting Vehicles	87	126	106	111
May – Worst Case for Bus Demand				
<u>Entering Vehicles</u>				
Autos	30	46	36	39
Charter Buses	4	5	4	4
Shuttle Buses	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>
Total Entering Vehicles	36	53	42	45
<u>Exiting Vehicles</u>				
Autos	31	50	41	42
Charter Buses	12	13	11	11
Shuttle Buses	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>
Total Exiting Vehicles	45	65	54	55

* Bus demand is shown for planned shuttle service at 25% mode share.

4.8.3 Future Traffic Volumes

In order to present a conservative analysis, the peak traffic volume hour of Jamestown Island was superimposed on traffic volumes for the adjacent roadway system (5 to 6 p.m.). By combining the two peaks, one can evaluate the “worst case” traffic volumes. For each alternative, consideration was given to the location of site attractions, parking facilities, and multimodal connections (water taxi, tram, multi-use trail, etc.). Peak hour traffic volumes are shown in Figures 4-12 through 4-16. Traffic volumes to the Glasshouse parking lot have been increased to simulate peak parking accumulation. Existing counts and future traffic projections to Jamestown Island include traffic also headed to the Glasshouse attraction. It is estimated that currently about half to three-quarters of all visitors to the Glasshouse also visit Jamestown Island. Given the increased intermodal connectivity of some of the proposed alternatives, it is projected that the Glasshouse area would become more fully part of the Jamestown Island experience. Accordingly, future traffic projections for Jamestown Island are assumed to fully include Glasshouse traffic and parking.

4.8.4 Future Year Traffic Operations

Future traffic operations have been evaluated for the Colonial Parkway for peak season (July), peak hour conditions. Procedures from the 2000 *Highway Capacity Manual* (HCM) were used to evaluate the capacity and quality of flow on the Colonial Parkway and at unsignalized intersections with Route 359 and parking lot entrances.

Table 4-26 provides a summary of the peak hour traffic operations at the intersection of the Colonial Parkway with Route 359, the Glasshouse Point parking lot entrance, and the proposed Neck of Land parking lot entrance. The eastbound Route 359 approach to the Colonial Parkway was found to operate at Level of Service B under all alternatives examined (no significant change from existing conditions). The Neck of Land parking lot entrance was also found to operate at Level of Service B under Alternatives B, C, and E (no facilities are proposed at Neck of Land under Alternatives A and D). All other movements would operate at Level of Service A. This indicates that a very good level of traffic service would continue to be provided on the Colonial Parkway in the year 2020 even during the peak design day, with little if any congestion being experienced by Jamestown Island visitors.

Table 4-26: Year 2020 Peak Hour Traffic Operations Summary

Intersection	Movement	Level of Service				
		Alt A	Alt B	Alt C	Alt D	Alt E
Colonial Parkway at Route 359	Route 359	B	B	B	B	B
	Overlook Parking Lot	A	A	A	B	A
	Westbound Lefts	A	A	A	A	A
	Eastbound Lefts	A	A	A	A	A
Colonial Parkway at Glasshouse Parking Lot	Parking Lot	A	A	A	A	A
	Eastbound Lefts	A	A	A	A	A
Colonial Parkway at Neck of Land Parking Lot	Parking Lot	NA*	B	B	NA	B
	Westbound Lefts	NA	A	A	NA	A

* NA indicates that no analysis was performed, as the unsignalized movement would not exist. Alternative A and D propose no facilities on the Neck of Land parcel.

The Level of Service analyses presented on the previous page assumed that 25% of all visitors arrive by shuttle. To assess a “worst-case” condition, traffic operations analyses were also performed for Alternative B with no shuttle usage. Even under this worst-case scenario there were no changes in peak hour operating conditions (Level of Service). The supporting documentation for this analysis can be found in Appendix J.

4.8.5 Parking Supply and Demand

The adequacy of the proposed parking supply in the year 2020 was assessed by examining projected parking accumulation at each parking lot for each alternative. Jamestown Island currently has one main parking lot with 333 total parking spaces.

Based on physical and environmental limitations on both Jamestown Island and the Neck of Land parcel, the total future parking supply was capped at no more than 350 parking spaces.

Table 4-27 provides a summary of projected parking accumulation at each proposed parking facility. The planned shuttle service is presumed to service at a 25% mode share for this analysis. Vehicle trip projections were also made for shuttle mode shares of 0% and 10%. This information is provided in Appendix J. Parking demand projections for the 0% and 10% shuttle mode share scenarios have not been presented in table, as they would result in frequent parking overflows during the peak summer months. If a 25% mode share is not achieved under the alternatives, then peak parking shortages would need to be reassessed, as discussed below.

Parking Lot Information	Alternatives				
	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Jamestown Island Main Parking Lot					
Number of Auto Parking Spaces	333	100	50	333	200
Peak Auto Accumulation	161	100	50	265	200
Number of Hours Exceeded	0	0	0	0	0
Number of Bus Parking Spaces	25	25	20	25	25
Peak Bus Accumulation	13	15	12	21	17
Number of Hours Exceeded	0	0	0	0	0
Neck of Land Parking Lot					
Number of Auto Parking Spaces	NA**	250	300	NA	100
Peak Auto Accumulation	NA	214	263	NA	76
Number of Hours Exceeded	NA	0	0	NA	0
Number of Bus Parking Spaces	NA	15	20	NA	8
Peak Bus Accumulation	NA	9	12	NA	5
Number of Hours Exceeded	NA	0	0	NA	0

* Projections conducted for July conditions for auto demand and May conditions for charter bus demand. Bus demand is shown for planned shuttle service at 25% mode share.

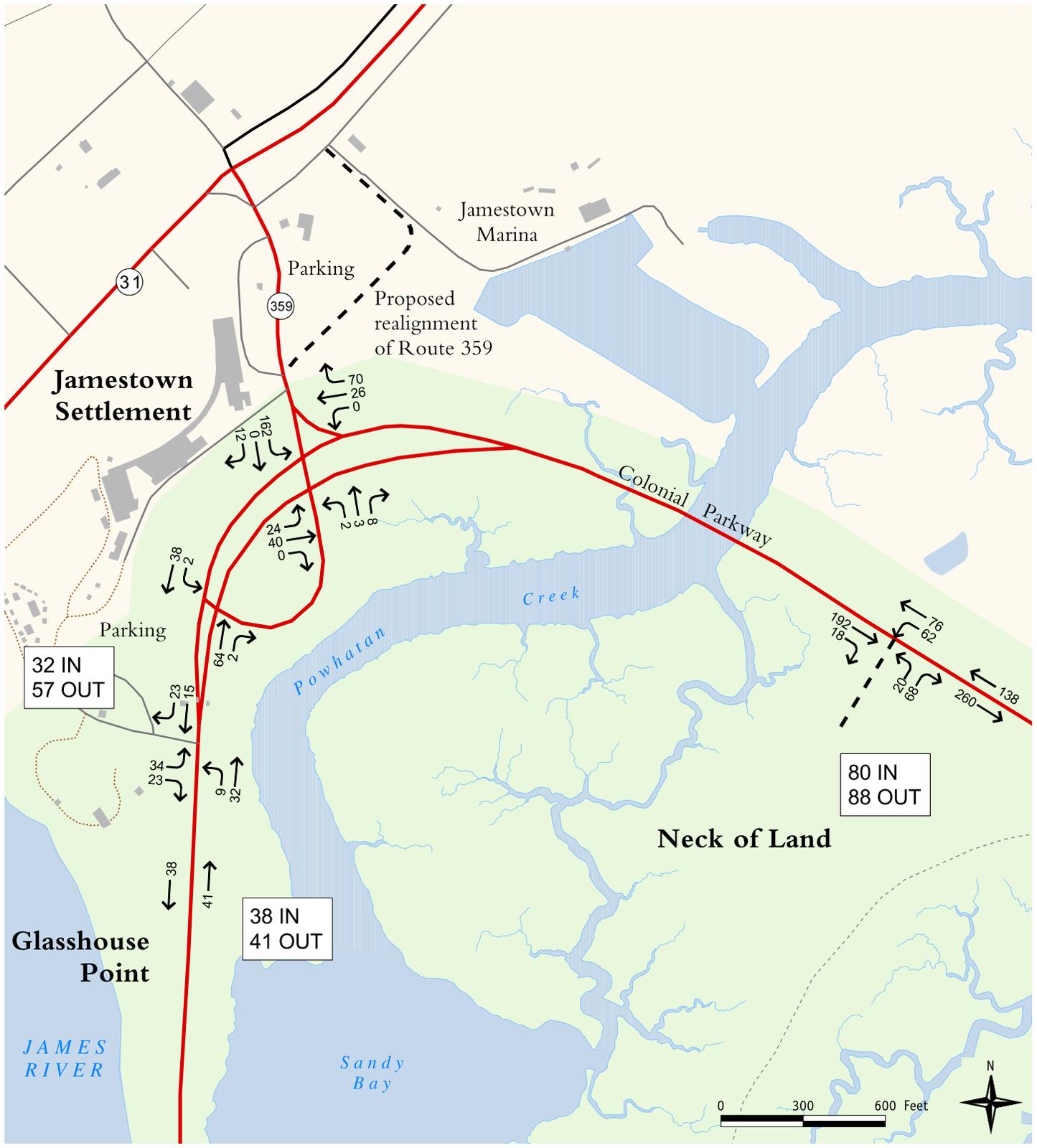
** NA indicates that the parking lot would not exist under the alternative being examined.



Legend

- Primary Route, Class 1
- Secondary Route, Class 2
- Road, Class 3
- Road, Class 4
- Road, Class 5
- Road in Service Facility, Rest Area or View Point
- - - Abandon Road
- Footbridge
- - - Trail
- - - Ferry Route
- Colonial National Historical Park

Figure 4-12: Year 2020 Peak Hour Weekly Traffic Volumes Alternative A



Legend

- Primary Route, Class 1
- Secondary Route, Class 2
- Road, Class 3
- Road, Class 4
- Road, Class 5
- Road in Service Facility, Rest Area or View Point
- - - - Abandon Road
- Footbridge
- - - - Trail
- - - - Ferry Route
- Colonial National Historical Park

Figure 4-13: Year 2020 Peak Hour Weekly Traffic Volumes Alternative B



Legend

- Primary Route, Class 1
- Secondary Route, Class 2
- Road, Class 3
- Road, Class 4
- Road, Class 5
- Road in Service Facility, Rest Area or View Point
- - - - - Abandon Road
- Footbridge
- ⋯ Trail
- - - - - Ferry Route
- Colonial National Historical Park

Figure 4-14: Year 2020 Peak Hour Weekly Traffic Volumes Alternative C



Legend

- Primary Route, Class 1
- Secondary Route, Class 2
- Road, Class 3
- Road, Class 4
- Road, Class 5
- Road in Service Facility, Rest Area or View Point
- - - Abandon Road
- Footbridge
- - - Trail
- - - Ferry Route
- Colonial National Historical Park

Figure 4-15: Year 2020 Peak Hour Weekly Traffic Volumes Alternative D



Legend

- Primary Route, Class 1
- Secondary Route, Class 2
- Road, Class 3
- Road, Class 4
- Road, Class 5
- Road in Service Facility, Rest Area or View Point
- - - Abandon Road
- Footbridge
- - - Trail
- - - Ferry Route
- Colonial National Historical Park

Figure 4-16: Year 2020 Peak Hour Weekly Traffic Volumes Alternative E

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The Glasshouse parking facility has not been included in the parking supply and demand analysis. Currently, this parking lot has been shown to have a bus/RV parking space shortage during peak demand days (May) but adequate auto parking (37-space demand with 55 parking spaces provided). By 2020, with most of the alternatives the Glasshouse would have significantly improved multimodal connections to the rest of Jamestown Island. Therefore, these spaces would likely be operating at or near capacity and more shared trips are expected from other Jamestown Island attractions.

If the 25% shuttle mode share is not achieved, then any of the following impacts could occur:

- Visitors would travel to Jamestown Island only to find full parking facilities.
- With advance information, visitors might shift to visit Jamestown Island during non-peak visitation hours (early morning, mid to late afternoon).
- Total projected visitation would not be realized.

If the 25% shuttle mode share is met, adequate auto parking would be provided for all alternatives on both the Island and at the Neck of Land parking lot (for Alternatives B, C, and E). During peak season events, these lots would approach capacity with Alternatives B, C, and E. Alternatives A and D, which both retain the existing number of parking spaces on the Island (333) would be more than adequate: Alternative A would only fill 161 spaces or 48% of lot capacity and Alternative E would fill 265 spaces or 80% of lot capacity. For Alternatives B, C, and E, parking at the Neck of Land would be constructed in phases (as needed). Initial parking would be provided at the Neck of Land lot for 100-150 auto spaces (100 additional spaces phased in) with Alternative B, 200 auto spaces (100 additional spaces phased in) with Alternative C, and 50 auto spaces (50 additional spaces phased in) with Alternative E.

4.8.6 Modal Transport Between Neck of Land and Jamestown Island

Due to the high concentration of irreplaceable resources on Jamestown Island, there are constraints that limit the ability of the Island to accommodate projected park visitation by auto access alone. Several of the action alternatives include an extension of the Jamestown Island experience to the Neck of Land parcel, located immediately north of Jamestown Island along the Colonial Parkway and separated from the Island by the Back River. Access between the Island and the Neck of Land parcel has been a major concern during the development of the alternatives.

4.8.6.1 Transportation Modes Considered

Four travel options (or modes of travel) have been proposed to connect the Neck of Land parcel with Jamestown Island: an interpretive water tour around Jamestown Island, a water taxi along the Back River, a tram service along the Colonial Parkway, and hiking/bicycle trails over the marsh/water. Figures 4-17 through 4-19 illustrate these options for Alternatives B, C, and E. In addition, the proposed Colonial Parkway shuttle identified in the *Alternative Transportation Systems Study* would also stop at both the Neck of Land parcel and at a bus drop-off on Jamestown Island, and may, in fact, operate as the tram service. Each mode of transport is detailed below:

Interpretive Water Tour

The interpretive water tour would not provide direct access between Neck of Land and Jamestown Island, but it would provide a totally new perspective of the Jamestown Island experience from the water. The tour would start from the Neck of Land dock along the Back River. A boat tour of approximately 1.5 hours would embark from this location during the warmer months (April through October) starting at 10 a.m. with three to four trips per day. While the specific details of this attraction would need refinement, it is envisioned that the boat would either circumnavigate Jamestown Island or

travel along the James River side of the Island. This boat tour is fairly similar to the current Jamestown Explorer boat tour; however, this service would be more directly linked to Jamestown Island with interpretive narrations coordinated or prepared by the NPS.

Water Taxi

Given the historical importance of waterborne transportation to local inhabitants at the time (both Island settlers as well as Virginia Indians), the inclusion of a waterborne component to the access system for Jamestown has both a historical context and relevance. This has been envisioned as a “water taxi” service using a pontoon-type boat with a capacity of 30 to 60 passengers. With Alternatives B and C, a three-stop service is proposed with stops at the Neck of Land parcel, Jamestown Island and the Powhatan Creek Overlook. The latter stop would provide access to the Glasshouse and the Jamestown Settlement. Alternative E proposes a shorter route with stops only at the Neck of Land parcel and Jamestown Island. It has been assumed that this service would operate only during the warmer months during peak park visitation (April through October).

Tram

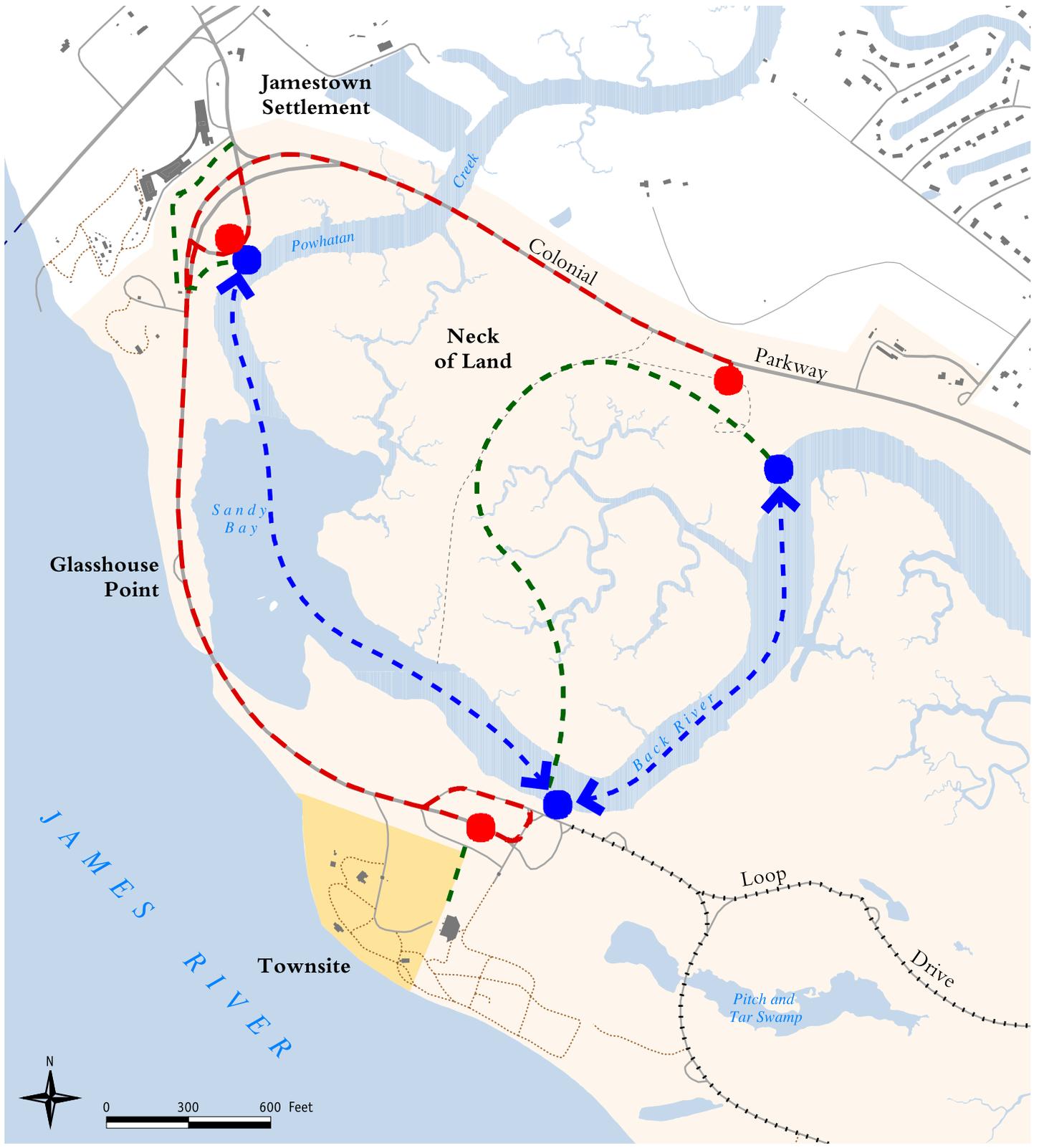
A Jamestown Island tram was proposed in the Alternative Transportation Systems Study to provide on-road transit service along the Loop Drive on Jamestown Island. A tram is defined by the Federal Transit Administration (CFR 49, 1997) as consisting of “a tractor unit, with or without passenger accommodations, and one or more passenger trailer units, including, but not limited to, providing shuttle service to remote parking areas, between hotels and other public accommodations, and between and within amusement parks and other recreation areas.” This service would start at the Neck of Land parcel (for Alternatives B, C, and E) and at either the Powhatan Creek Overlook or at the Jamestown Settlement (to be determined) with Alternatives A and D. This tram would provide access to Jamestown Island and then continue on the

Jamestown Island Loop Drive. This service is envisioned with a typical vehicle capacity for 30 passengers. It is not known if the tram would be a continuous service or whether the Neck of Land tram and the Loop Drive tram would be separate services. The tram service has also been proposed as a seasonal service operating between April and October. A feasibility analysis of this proposed tram service was provided in the *Alternative Transportation System Study*, Phase I (BRW and Cambridge Systematics 2001), and the *Alternative Transportation System Study*, Phase II, scheduled to be completed in 2003, will further define detailed information.

Non-Motorized Travel

Pedestrian hiking/bicycle trails are proposed to connect various attractions at Jamestown. Alternative B is the only alternative that is proposing a direct pedestrian connection between the Neck of Land parcel and Jamestown Island. This would consist of a marsh boardwalk and a 12- to 14-foot wide bridge over Back River. The total walking distance from the Neck of Land parking lot to Jamestown Island would be approximately 0.64 miles. The bridge would be 14 to 14.5 feet above mean high tide, which is the current vertical clearance of the Sandy Bay Bridge (the structure connecting Jamestown Island to the causeway).

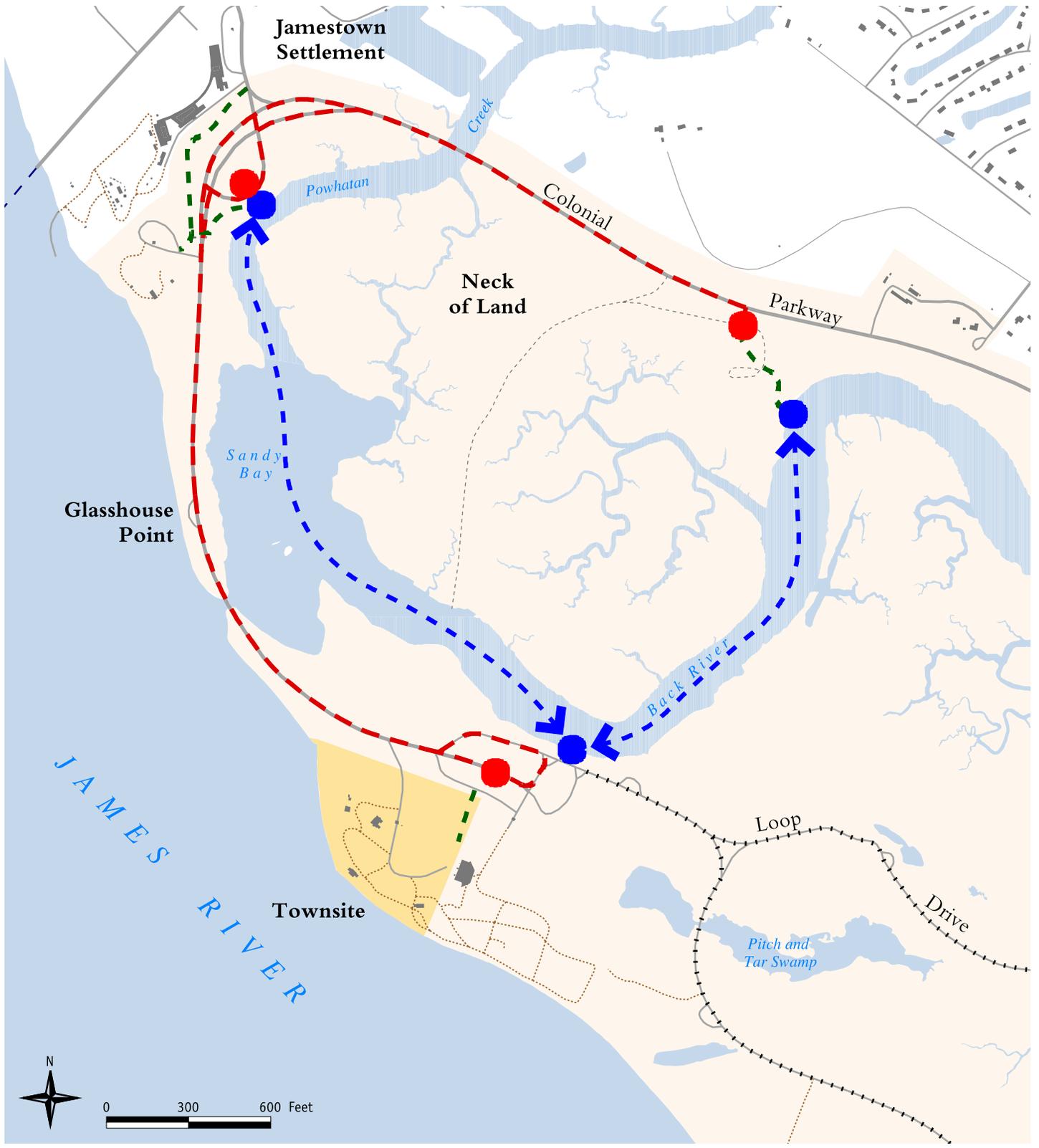
Alternatives C and E provide new trails between the Neck of Land parcel and the Powhatan Creek Overlook area via a marsh boardwalk, and would thus provide a convenient connection between the Neck of Land parcel and the Glasshouse. However, this indirect linkage would result in a walking distance of over a mile from the Neck of Land parcel to reach Jamestown Island. In general, pedestrians are generally unwilling to walk much in excess of ½ mile when other forms of transportation are available.



Legend

- Proposed Dock
- Proposed Tram Stop
- - - Hiking / Biking Trails
- - - Water Taxi Route
- - - Parking Lot Tram Route
- Loop Drive Tram Route
- Colonial National Historical Park
- Association for the Preservation of Virginia Antiquities

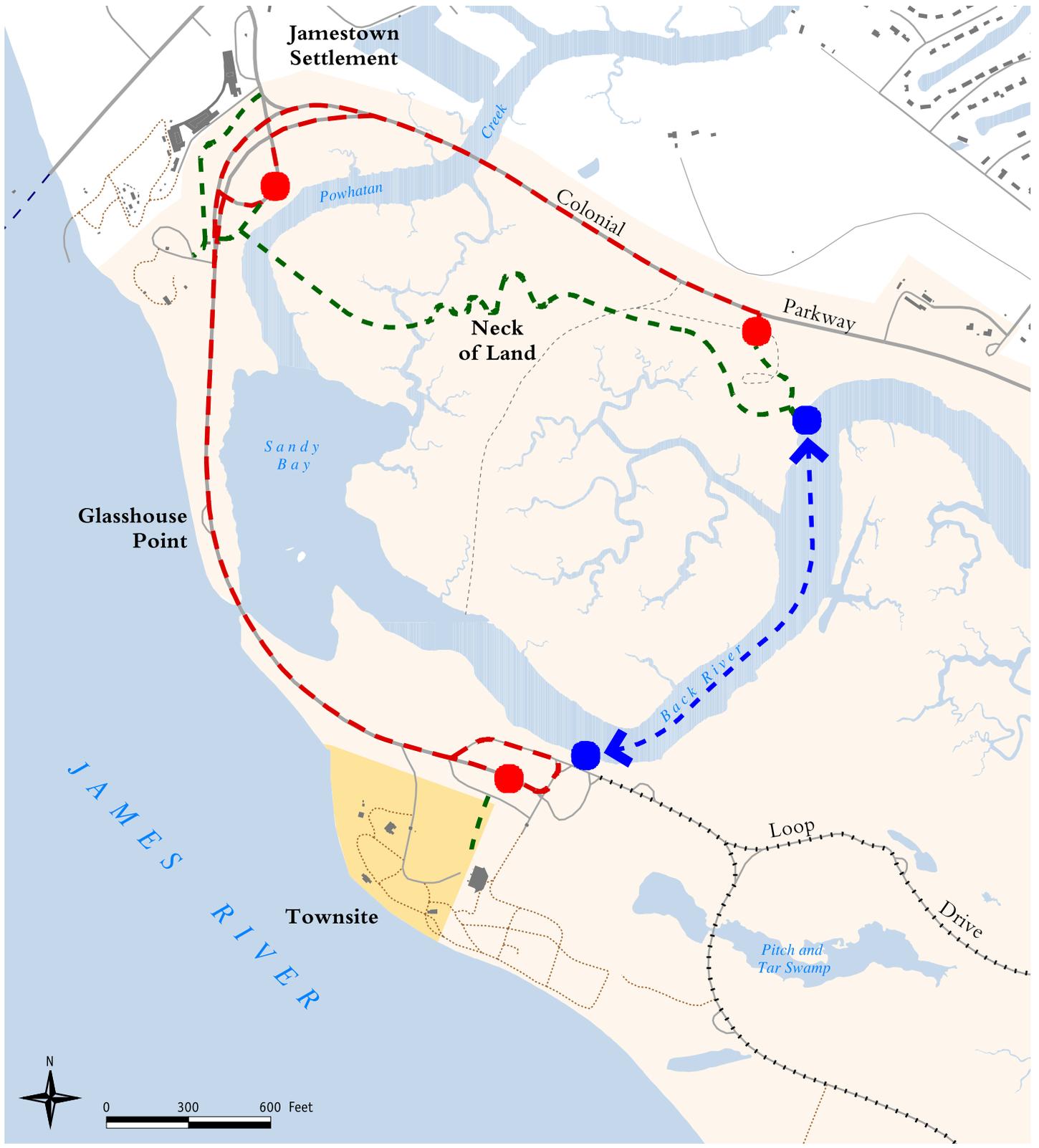
Figure 4-17: Multimodal Circulation Options Alternative B



Legend

- Proposed Dock
- Proposed Tram Stop
- - - Hiking / Biking Trails
- - - Water Taxi Route
- - - Parking Lot Tram Route
- Loop Drive Tram Route
- Colonial National Historical Park
- Association for the Preservation of Virginia Antiquities

Figure 4-18: Multimodal Circulation Options Alternative C



Legend

- Proposed Dock
- Proposed Tram Stop
- - - Hiking / Biking Trails
- - - Water Taxi Route
- - - Parking Lot Tram Route
- Loop Drive Tram Route
- Colonial National Historical Park
- Association for the Preservation of Virginia Antiquities

Figure 4-19: Multimodal Circulation Options Alternative E

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Colonial Parkway Shuttle

This proposed bus service between Yorktown, Williamsburg, and Jamestown would stop at both the Neck of Land parcel and on Jamestown Island. This service may supplement the proposed in-park tram service, depending on headways and passenger demand. It has been assumed that visitors would be encouraged to stop and visit the Neck of Land attractions first before continuing on to the Island.

4.8.6.2 Future Projection Assumptions

Future visitation projections have been prepared for each alternative after an examination of the attractions being proposed, the location of these facilities relative to each other, and the attractiveness of the entire experience. All of the proposed in-park travel modes are projected to significantly add to the total visit by incorporating the local surroundings more fully into the Jamestown Island experience. This is projected to contribute to longer visits at the Island and would result in an increase in recurring visitation, particularly from local residents in the Williamsburg/James City County area. These increases would tend to occur throughout the year. The projections of future visitation at Jamestown Island would therefore be reduced without the provision of these multimodal transportation options within the park.

4.8.6.3 Travel Time Comparison

An estimate of potential travel times is needed to determine how visitors are likely to travel between the Neck of Land parcel and Jamestown Island. A precise determination of which travel mode a visitor would chose (water taxi, tram or walking) can not be made without conducting detailed surveys of customer preferences. Instead, Neck of Land visitors have been assigned into each of the three competing modes based on their relative convenience to visitors over a typical peak season hour. These assumptions of mode choice generally took into account mobility characteristics of existing visitors, including ages of visitors, persons with disabilities, and persons with small children. Table 4-28 contains a summary of assumptions made.

System Assumptions	Water Taxi	Tram	Walk
Average Speed (mph)	6.4	15	2.73
Stop time (minutes)	5	Included*	NA
Vehicle Capacity	60	35	NA
Peak headway (min)	20	20	NA

* Average travel speed includes interim stops and circulation delays.

The water taxi would typically operate with two boats in service for Alternatives B and C and one boat for Alternative E. The total travel time for the round trip, including docking, boarding and alighting of passengers at a total of four dock stops, is projected to be approximately 30 to 35 minutes for Alternatives B and C and 15 minutes for Alternative E. With Alternatives B and C, therefore, the first boat would leave the Neck of Land dock, proceed to the Jamestown Island dock, discharge and board passengers, and then continue to the Powhatan Creek Overlook dock. After docking, discharging and boarding passengers at this third dock, the boat would return to the Jamestown Island dock and then on to the Neck of Land dock. This would result in a total of six boat trips each hour (three headed west toward the Overlook and three headed east toward the Neck of Land).

With Alternative E, only two dock stops would be needed (one at Neck of Land and one at Jamestown Island), thus significantly reducing the overall travel time and allowing one boat to provide the planned 20-minute service headway. This would result in a total of six boat trips each hour (three headed south toward the Jamestown Island and three headed north toward the Neck of Land).

For Alternatives B, C, and E, travel distances, wait times, and loading and unloading times were determined for each mode. Table 4-29 presents a travel time summary of proposed transportation links between the Neck of Land parcel and Jamestown Island.

Table 4-29: Projected Travel Times between Neck of Land and Jamestown Island by Transport Mode (Peak Season)

Alternative	Mode	Transit Mode				Walk Mode			Total All Modes		
		Distance (miles)	Average Waiting Time* (minutes)	Total Travel Time** (minutes)	Average Operating Speed (mph)	Distance (miles)	Total Travel Time** (minutes)	Average Operating Speed (mph)	Distance (miles)	Total Travel Time** (minutes)	Average Operating Speed (mph)
B	Water	0.42	9.51	13.42	6.4	0.23	5.00	2.73	0.64	18.42	2.10
	Walk	NA	0.00	NA	NA	0.64	14.17	2.73	0.64	14.17	2.73
	Tram	1.75	9.34	16.34	15.0	NA	NA	NA	1.75	16.34	6.43
C	Water	0.42	9.51	13.42	6.4	0.23	5.00	2.73	0.64	18.42	2.10
	Tram	1.75	9.34	16.34	15.0	NA	NA	NA	1.75	16.34	6.43
E	Water	0.32	9.29	12.31	6.4	0.23	5.00	2.73	0.55	17.31	1.90
	Tram	1.75	9.34	16.34	15.0	NA	NA	NA	1.75	16.34	6.43

* Average waiting time represents time incurred by visitor while waiting for a transit mode to arrive.

** Total travel time includes both average waiting time and in-vehicle transit time.

NA Not applicable.

The simulated travel times represent the average time required to travel from the Neck of Land parking lot to the Jamestown Island parking lot. For the water taxi service, a walk mode is needed to travel between the dock and the parking lot on both ends of the trip.

As the tram and water taxi modes have been assumed to operate on fixed headways, the fastest mode varies for visitors throughout a typical hour. It was assumed that while both the tram and water taxi would operate on 20-minute headways, they would be equally spaced. This means that there would only be a maximum average wait of 10 minutes between the departure times of a transit vehicle. To determine the average travel times for the tram and water taxi modes and to compare how they would vary over a typical one-hour period, average travel times were simulated in one-minute increments for each of the three travel modes. For each mode, the average travel time over the entire hour was then determined. The details of these analyses are provided in Appendix J. The usage of, or the connection of, this proposed tram service to serve Jamestown Settlement visitors was not considered at this time.

4.8.6.4 Mode Split to Travel Between the Neck of Land and Jamestown Island

For travel mode choices, it was found that the shorter the travel time, the higher the usage. The mode split was developed using travel time impedance factors, which were determined based on the ratio of the average travel time for all three modes divided by the average travel time of the individual mode. The proportion of the mode's impedance factor to the sum of the impedance factors for all three modes was used to develop the mode split, namely the percentage of visitors that would select a particular mode of travel. This is a very conservative analysis, in that the summer weather (temperature and high humidity) experienced at Jamestown Island and characteristics of the expected visitor population are together expected to encourage increased usage of transit modes compared to walking.

Table 4-30 summarizes the resulting mode split projections and annual visitor mode usage for each alternative. First, assumptions were made concerning the percent of total visitation by park-external travel mode (auto, shuttle bus or charter

bus) that would stop at the Neck of Land parcel. It was assumed that 68% of auto visitors would stop at the Neck of Land with Alternative B, 95% with Alternative C (the Visitor Center would be located on the Neck of Land parcel with this alternative), and 35% with Alternative E. During peak months, these percents would change to more closely mirror the ratio of parking supply between the Island and the Neck of Land parcel.

The mode split for visitors traveling between the Neck of Land parcel and Jamestown Island is also shown in Table 4-30. For Alternative B, during the peak operating months (April through October), it was estimated that 35% of Neck of Land visitors would use the hike/bicycle trail, 31% would use the water taxi, and the remaining 34% would use the tram service. For Alternatives C and E, with no direct pedestrian connection between the Neck of

Land parcel and Jamestown Island, the walking mode would not be a viable mode of travel. With Alternative C, 47% of visitors would use the water taxi and the remaining 53% would use the tram service. During the off-peak months (November through March), the tram and water taxi services would not operate.

4.8.6.5 Annual Ridership Projections between Neck of Land and Jamestown Island

As shown in Table 4-31, the proposed water taxi service is projected to serve 136,400 annual round trips with Alternative B, 266,440 annual round trips with Alternative C, and approximately 103,800 annual round trips with Alternative E. The annual ridership (single one-way trips) is double these projections, reflecting that one visitor makes two trips (one there and one back).

Table 4-30: 2020 Mode Split Projections for Transport between Neck of Land and Jamestown Island (Peak Season)

	Alternative		
	B	C	E
Mode Split to Access Jamestown Island (April – October)			
Percent by Tram	34%	53%	52%
Percent by Water Taxi	31%	47%	48%
Percent by Walk	35%	0%	0%
Total Annual Visitors to Neck of Land	488,110	726,600	252,500
Total Annual Visitors By Mode**			
Tram (April – October)	149,600	300,450	112,440
Water Taxi (April – October)	136,400	266,440	103,800

* Percentages indicated percent of total auto visitors to Jamestown Island that are projected to stop and park at Neck of Land. This percent can vary in peak months (higher with Alternative B and lower with Alternatives C and E).

** Number of visitors projected to use each mode is identified. Total projected ridership is twice the above estimates.

Table 4-31: 2020 Monthly Round Trip Ridership Projections for Proposed Water Taxi Service

Month	Alternative		
	B	C	E
January	0	0	0
February	0	0	0
March	0	0	0
April	22,040	35,380	18,300
May	20,260	36,570	16,900
June	20,740	41,870	16,440
July	22,630	43,750	14,970
August	19,320	39,520	12,680
September	12,920	31,290	9,890
October	18,490	38,060	14,620
November	0	0	0
December	0	0	0
Total	136,400	266,440	103,800

4.8.7 Feasibility Assessment of Proposed Water Taxi Service

4.8.7.1 Operational Analysis

Based on the projected seasonal operation of the proposed water taxi service, an operational analysis was conducted to determine potential operating costs and feasibility of transport mode. To perform this analysis, operating characteristics of existing ferry/water taxi services were considered through a literature review of NPS and non-NPS ferry services, and in coordination with input from three existing boat operators: the Jamestown Explorer of Jamestown, Virginia; Harbor Boating of Baltimore, Maryland; and City Water Taxi of Boston, Massachusetts. The first service is currently in operation in the vicinity of Jamestown Island using pontoon boats of similar size, however this service operates as a nature cruise on 1-½ hour headways. The Baltimore harbor service is a water taxi service that formerly used pontoon-type watercraft. The Boston water taxi service was selected to evaluate how the intensity of use inherent in a water taxi might affect operating costs.

For Alternatives B and C, the total water taxi route is slightly over two miles round trip with four stops at: Neck of Land, Jamestown Island (twice), and Powhatan Creek Overlook. For Alternative E, the water taxi would only operate between the Neck of Land parcel and Jamestown Island.

Table 4-32 presents the operational characteristics of the proposed water taxi services for Alternatives B, C, and E. The top section details operational measures, such as the proposed peak headway, vessel capacity, the number of vessels needed, route miles, and other key design criteria. The bottom half of the table presents financial projections (presented in current dollar value) to operate the water taxi service. Included in these projections are direct operations and maintenance costs, administrative overhead costs, including profit, and annualized capital costs (vessel acquisition and dock construction costs).

Based on the projected service and ridership, the estimated cost per rider (round trip) would be \$2.21 for Alternative B, \$1.13 for Alternative C and \$2.84 for Alternative E.

Table 4-32: Proposed Water Taxi Operational Characteristics

System Assumptions	Alternative		
	B	C	E
Peak Hourly Headway (minutes)	20	20	20
Vessel Capacity	30-60	30-60	30-60
Round-trip route (miles)	2.08	2.08	1.20
Number of stops (round trip)	3	3	2
Stop time at dock (minutes per stop)	5	5	5
Peak Vessels in Service	1	1	1
Required Fleet	2	2	2
Annual vessel operating hours	2,100	2,100	2,100
Service days	210	210	210
Daily round-trips	30	30	30
Daily vehicle miles of travel	62.4	62.4	36.0
Average daily ridership (round trip)	650	1,269	494
Total Operating Costs (direct O&M and admin. overhead)	\$276,545	\$276,545	\$274,850
Annualized capital costs (dock and vessel)	\$24,313	\$24,313	\$20,022
Total annual cost	\$300,860	\$300,860	\$294,870
Projected break-even cost per rider (round trip)	\$2.21	\$1.13	\$2.84

4.8.7.2 Other Potential Waterborne Transport Uses

In addition to the strictly functional aspects of the water taxi and supporting dock facilities, there is also potential to use these new amenities to add additional waterborne transportation modes as recreational and cultural attractions. Possibilities include dinner cruises on the James River, nature cruises, and replica boat cruises. A dinner cruise would require a larger vessel, accommodating up to 100 passengers. A replica boat could be built to simulate a 17th century watercraft and be used to provide a circuit tour around Jamestown Island. Additional study would be needed to explore the feasibility of these services.

4.8.7.3 Water Taxi Feasibility Conclusions

The proposed water taxi service has tremendous potential to significantly add to the Jamestown experience and provide an attractive and fairly efficient transportation link between the Neck of Land parcel and Jamestown Island. The projections developed in this document assume that the user

cost of the proposed transit services (water taxi and tram) are not charged on entry but are subsidized indirectly through the cost of admission to the other attractions at Jamestown Island. The introduction of a cost of admission could significantly change the mode split projections. Without additional study on the elasticity of demand for transit ridership at NPS facilities (at either Jamestown Island or another NPS facility), the willingness of visitors to pay for these services is not known. This is important mainly for Alternative B, as there are two transit modes and one walking mode (which is free). It is likely that fees much in excess of \$1 per one-way trip (\$2 round trip) would deter usage of the two transit modes. A detailed stated preference survey would be needed of existing visitors to Jamestown to determine the elasticity of demand due to pricing, population characteristics (i.e., mobility), or weather.

If the water taxi service is operated, the NPS would need to consider whether a fare would be charged for the proposed transit services, and if so, how

much of the difference between the fare charged and the break-even cost is built into the general admission price for other Jamestown attractions. The APVA and NPS are currently considering how fees should be collected with each alternative, so a detailed fare collection plan would be further defined in the future. The concept is to collect the entry fee at key buildings (Visitor Center, ticketing facility, Intermodal Transportation Terminal, etc.), not upon entry by vehicle.

4.8.8 Evaluation of Alternative Impacts

4.8.8.1 Effects of Alternative A (No Action)

Year 2020 transportation conditions in the Jamestown Island area are projected to continue to operate with good Levels of Service on the Colonial Parkway with or without the proposed implementation of the Colonial Parkway shuttle bus service. The existing parking supply would be adequate to accommodate 2020 peak season, design day conditions.

4.8.8.2 Impacts Common to the Action Alternatives

The Colonial Parkway shuttle service would be needed to serve all proposed parking facilities at designated transfer points. Traffic conditions throughout the year would continue to operate at very good Levels of Service (A and B). Without the proposed shuttle bus service, the planned parking supply would be insufficient for all action alternatives. However, good Levels of Service would still be maintained on the Colonial Parkway.

4.8.8.3 Effects of Alternative B

The provision of multimodal transportation options at Jamestown would provide for more versatile transportation access and circulation for the entire area, thereby enhancing the visitor experience.

Improved parking facilities would be provided on Jamestown Island and on the Neck of Land parcel. The Island parking lot would be reduced in size from 333 auto spaces to 100-150 auto spaces and

25 bus/RV spaces. The Neck of Land parcel would have a 250-space parking lot (100-150 spaces initially with the remaining 100 spaces constructed as needed) with 15 bus/RV spaces. The Glasshouse area would also have an improved parking facility but with the same parking capacity as is currently provided (55 auto spaces and 6 bus/RV spaces).

The intersection of the Colonial Parkway with the Neck of Land parking lot would require significant geometric improvements in order to safely accommodate projected vehicular demand. Given the large number of left turns into the parking lot, it would be prudent to construct a median on the Colonial Parkway in this area, to provide a sheltered intersection configuration. A southbound left-turn lane would be provided in the median and an eastbound right-turn lane would be provided into the parking lot. These turn lanes would need to provide a minimum of 200 feet of storage and a 200-foot long taper to accommodate the expected high volume of buses and in accordance with VDOT design standards.

The impact of providing separate parking facilities would be the need for improved signage to direct visitors (particularly visitors arriving by auto) and potentially changeable message signs to indicate when the Jamestown Island parking lot is full. Without way-finding improvements, there may be increased visitor frustration. In addition, for visitors arriving from the Route 31/Route 359 corridor, they are entering the site inside the Neck of Land parcel. These visitors would therefore be more likely to proceed directly to the Island and Glasshouse parking lots, and therefore may miss the benefits of the Intermodal Transportation Terminal planned for the Neck of Land parcel without the provision of way-finding signage.

The proposed hike/bicycle trail proposed in Alternative B provides a fairly direct path between the Neck of Land parcel and Jamestown Island. This trail is likely to experience significant use in connecting planned facilities as well as being

attractive for recreational purposes. Coupled with the proposed water taxi and tram service connections, a very attractive multimodal connection would exist between Jamestown Island and the Neck of Land facility. Visitors would be able to walk one way, and then take either the water taxi or the tram back on the return trip.

The pedestrian bridge over the Back River would slow down existing boat traffic, with a vertical clearance over 14 feet. The proposed bridge clearance is the same as currently at the Sandy Bay Bridge.

The proposed water taxi and interpretive water tour services proposed in Alternative B may act as a significant attraction by itself and would undoubtedly attract more Jamestown Settlement visitors to Jamestown Island. The connection of the water taxi at the Powhatan Creek Overlook would significantly add to the visibility and inclusiveness of the Jamestown experience. Once on the water taxi, Settlement visitors would then be more likely to stop and visit Jamestown Island or Neck of Land attractions.

The addition of six to seven boat trips per hour on the Back River and Powhatan Creek during the April through October peak months would impact existing boat traffic, resulting in slower travel speeds and delay while water taxis are maneuvering into or out of a dock. The Back River, with two boat docks, will be more impacted than Powhatan Creek with one boat dock.

4.8.8.4 Effects of Alternative C

The provision of multimodal transportation options at Jamestown Island would provide for more versatile transportation access and circulation for the entire Jamestown area, thereby enhancing the visitor experience.

Improved parking facilities would be provided on Jamestown Island and on the Neck of Land parcel. The Island parking lot would be reduced in size

from 333 auto spaces to 50 auto spaces and 20 bus/RV spaces. The Neck of Land parcel would have a 300-space parking lot and 20 bus/RV spaces (the auto spaces would be phased with 200 spaces built initially). The Glasshouse area would also have an improved parking facility but with the same parking capacity as is currently provided (55 auto spaces and 6 bus/RV spaces).

Similar to Alternative B, the Colonial Parkway would require the construction of a median in the vicinity of the Neck of Land parking lot entrance and the construction of left and right-turn lanes entering the parking lot. These turn lanes would need to provide a minimum of 200 feet of storage and a 200-foot long taper.

With Alternative C, the Neck of Land would be the primary gateway for all visitors to Jamestown. Way-finding signage would therefore be needed to direct all visitors to the Neck of Land Visitor Center. Visitors arriving from the Route 31/Route 359 corridor would be more likely to proceed directly to the Island and Glasshouse parking lots. Given the limited parking planned on the Island, these visitors may experience frustration and may miss the Visitor Center entirely without adequate way-finding signage.

In Alternative C, the proposed hike/bicycle trail system provides a connective, but long path between the Neck of Land parcel and Jamestown Island because the trail would continue to be on the Colonial Parkway (as is currently). This may also make it less conducive to pedestrian travel, as pedestrians and cyclists would use the same roadway as vehicles.

The addition of six to seven boat trips per hour on the Back River and Powhatan Creek during the April through October peak months will impact existing boat traffic, resulting in slower travel speeds and delay while water taxis are maneuvering into or out of a dock. The Back River, with two boat docks, will be more impacted than Powhatan Creek with one boat dock.

4.8.8.5 Effects of Alternative D

Alternative D would not significantly change the existing transportation system. No water taxi service, interpretive water tour or nature trail is proposed with this alternative. A hike/bicycle trail would be provided to connect the Jamestown Settlement with the Glasshouse area. No other pedestrian accommodations would be provided along the Colonial Parkway. The ability for bicycles to use the Parkway would continue; however, pedestrians would have no safe connection between the Glasshouse area and Jamestown Island.

The existing Jamestown Island parking facility would remain unchanged with Alternative D. The Island parking lot would continue to provide 333 auto spaces and 25 bus/RV spaces. The Glasshouse area would also have an improved parking facility but with the same parking capacity as is currently provided (55 auto spaces and 6 bus/RV spaces).

The Jamestown Island experience would be more self-contained with Alternative D. Similar to existing conditions and Alternative A, all visitors would approach the project from one road (Colonial Parkway) and would park in one main parking lot (with the exception of the Glasshouse attractions). The ability of this alternative to attract recreational visitors (for walking, bicycling, bird watching, etc.) is likely to be more limited than with some of the other alternatives proposed.

4.8.8.6 Effects of Alternative E

The provision of multimodal transportation options at Jamestown would have the same benefits as those described for Alternative B.

Improved parking facilities would be provided on Jamestown Island and on the Neck of Land parcel; however, no net addition in parking (over what currently exists) is planned. The Island parking lot would be reduced in size from 333 auto spaces to 200 auto spaces with 25 bus/RV spaces. The Neck of Land parcel would have a 100-space auto parking lot with 8 bus/RV spaces (the auto spaces would be

phased with 50 spaces built initially). The Glasshouse area would also have an improved parking facility but with the same parking capacity as is currently provided (55 auto spaces and 6 bus/RV spaces).

Similar to Alternatives B and C, the Colonial Parkway would require the construction of a median in the vicinity of the Neck of Land parking lot entrance and the construction of left and right-turn lanes entering the parking lot. These turn lanes would need to provide a minimum of 200 feet of storage and a 200-foot long taper.

The impact of providing separate parking facilities would be the need for improved signage to direct visitors (particularly visitors arriving by auto) and potentially changeable message signs to indicate when the Jamestown Island parking lot is full. Without way-finding improvements, there may be increased visitor frustration. In addition, for visitors arriving from the Route 31/Route 359 corridor, they are entering the Jamestown area after the Neck of Land parcel. These visitors would therefore be more likely to proceed directly to the Island and Glasshouse parking lots, and therefore may miss the benefits of the Intermodal Transportation Terminal planned for the Neck of Land parcel without the provision of way-finding signage.

The water taxi service proposed for Alternative E is more limited than proposed in Alternatives B and C, covering only a 3,000-foot distance between the Neck of Land parcel and Jamestown Island on the Back River. The potential for use of this water taxi service by Jamestown Settlement visitors would be limited. This water taxi, plus the proposed tram service, would provide the primary transportation links between Jamestown Island and Neck of Land.

The addition of six to seven boat trips per hour on the Back River during the April through October peak months would impact existing boat traffic, resulting in slower travel speeds and delay while water taxis are maneuvering into or out of a dock.

The proposed hike/bicycle trail proposed in Alternative E provides a fairly direct path between the Neck of Land parcel and Glasshouse Point. The addition of an observation platform and the construction of this path as a boardwalk over the marsh would likely attract visitors for recreational purposes (walking, bicycling, bird watching, etc.).

4.8.8.7 Impacts of Shuttle Service on all Alternatives

Most analyses presented in this section assumed that by 2020, approximately 25% of all peak season visitations to Jamestown Island would occur via a proposed Colonial Parkway shuttle. If this service does not occur, then significant additional parking would be required for all action alternatives in order to accommodate peak season, design day conditions. While traffic volumes would be higher without the shuttle service, Level of Service B or better conditions would still be experienced on the Colonial Parkway at the intersections studied for all alternatives. The following potential impacts of parking shortages could occur:

- Visitors would travel to Jamestown Island only to find full parking facilities.
- With advance information, visitors might shift to visit Jamestown Island during non-peak visitation hours (early morning, mid to late afternoon).
- Total projected visitation would not be realized.

4.8.9 Cumulative Impacts

Combined with improvements to Route 359, the transportation improvements required by each of the action alternatives would have cumulative impacts to transportation and visitor experience. By forming a cohesive transportation network, the improvements would have benefits beyond simply serving the specific need for which they are designed. The resulting network would make the entire site more understandable and navigable for the visitor.

4.8.10 Conclusion

Future year evaluations have been conducted for all five Jamestown Project alternatives for traffic operations, parking supply and demand, way-finding, and the internal multimodal connections proposed within the Jamestown Project boundaries. The following conclusions have been determined:

- Traffic operations on the Colonial Parkway would operate at acceptable levels (Level of Service B or better) even during peak season, design day conditions with all five alternatives. The presence, or lack of, a Colonial Parkway shuttle would not significantly change traffic operations;
- Parking demand would be accommodated for all alternatives studied;
- The water taxi service proposed in Alternatives B, C, and E has significant potential to attract ridership between the Neck of Land parcel and Jamestown Island. The NPS would need to determine how the cost for this service is paid, and whether all or a portion of the projected operational costs, would be subsidized in an increase in admission to the major Island attractions;
- The water taxi service proposed in Alternatives B, C and E would increase existing boat traffic on the Back River and Powhatan Creek, and this may slow or hinder existing boat traffic; and
- With Alternatives B, C, and E, the development of a comprehensive way-finding signage program, including the use of variable message signs, would be needed to minimize visitor confusion and to maximize the use of parking lots at both Neck of Land and on Jamestown Island.

4.9 SUMMARY AND CONCLUSION

The following discussion presents a summary of the impacts to natural, physical, and socioeconomic resources at Jamestown, with regard to sustainability, unavoidable adverse impacts, irreversible and irretrievable commitments of resources, and impairment. Table 2-4 (located at the end of “Chapter 2: Alternatives”) provided a summary comparison of impacts and effects related to each of the proposed alternatives.

4.9.1 Relationship of Short-term Uses with Long-term Productivity (Sustainability)

Actions are described in terms of the NEPA objective to maintain and enhance the long-term productivity of the environment. All of the action alternatives include elements that would diminish and elements that would enhance the long-term productivity of the environment.

Development of new facilities would remove some areas from natural productivity; however, the provision of new facilities would use several design strategies to minimize impacts and offset loss of productive land: 1) energy conservation measures would minimize the use of non-renewable energy inputs; 2) durable materials would minimize maintenance requirements; and 3) well-designed facilities meeting user needs would keep visitors in appropriate locations, preventing impacts to productive natural areas and thus minimizing or offsetting overall loss of productivity.

Construction of facilities for archives and collections would have the long-term effect of preserving valuable resources unimpaired for future use. Coordinated APVA and NPS research and education opportunities in the short-term would have the long-term effect of creating a higher profile and prestige for Jamestown Island. This could lead to increased visitation and opportunities for educational partnerships.

4.9.2 Unavoidable Adverse Impacts

Unavoidable adverse impacts would result from implementing any alternative, as described below.

4.9.2.1 Alternative A (No Action)

Unavoidable adverse impacts would result from the continuation of existing management policies and physical conditions on Jamestown Island. The NPS archives and collections are at risk of permanent loss or damage from flood and mildew in the existing collections storage facility located in the basement of the Visitor Center. In addition, visitor facilities would remain inadequate to provide visitor satisfaction and education, as there is currently inadequate existing space for site orientation, exhibits, education programs, restrooms, food service, and donor support facilities. The decrease in visitation and lack of understanding of the historical significance of the site would continue.

No best management practices or mitigative measures are currently in use at Jamestown to treat runoff from impervious surfaces or sedimentation from erosion. Under the No Action Alternative, no improvements would be made, and contaminated or polluted runoff would continue to flow freely into surface and ground waters around Jamestown Island. Additionally, there would be no replacement of aging sewer lines or petroleum storage tanks, which could fail causing groundwater contamination.

4.9.2.2 Action Alternatives B, C, D, and E

Short and long-term disturbance and soil and vegetation loss from construction activities relating to new facilities and burial of utility lines would result. Implementation of appropriate erosion and sedimentation control plans, best management practices, and revegetation plans would minimize the magnitude of these effects where they occur.

Loss of habitat, both wetland and upland, would result from implementation of any of the action alternatives. This would adversely affect plant and

animal populations at Jamestown. The increase in impervious cover resulting from additional building and parking space would have a potentially adverse impact to water quality of surface waters. However, these impacts could be mitigated to minimize long-term adverse effects.

Predicted increases in visitation, as well as construction activities and proposed multimodal transportation options, would have an adverse impact on the bald eagles nesting at Jamestown Island. A Visitor Center/ticketing facility in the Island parking lot would be within the 1,320-foot radius protective zone, as would the southern Back River boat dock and the interpretive boat tour (in Alternatives B, C, and E). Alternative D may also have an adverse impact because more vehicles would be coming and going from the Island parking lot. Although impacts related to construction activities could be avoided by implementing the No Action Alternative, other resources and values would be impacted by this decision.

For archaeological resources, an archaeologist would be on hand during construction to identify unknown archaeological sites that could be uncovered. If significant archaeological resources were found before or during construction activities, the proposed facilities could be relocated, or the archaeological resources could be excavated to salvage the artifacts. Under the latter condition, impacts to the archaeological resources would be unavoidable.

To ensure safety at the Neck of Land facilities, loss of historic material from the Colonial Parkway and/or introduction of new design elements could affect the character of the Parkway. Additionally, alterations to areas visible from the Parkway would adversely affect cultural landscapes and viewsheds. However, design of new elements to minimize change, follow original design parameters, and use materials matching historic materials, as well as design consultation with the State Historic Preservation Officer, would minimize these effects.

4.9.3 Irreversible and Irrecoverable Commitments of Resources

An irreversible commitment of a resource is one that cannot be changed once it occurs; an irretrievable commitment means that the resource cannot be recovered or reused.

If the NPS portion of the Jamestown collection is not removed from the basement of the existing Visitor Center, the valuable collection could be damaged, destroyed, or lost, resulting in an irreversible and irretrievable commitment of this resource.

Any loss of undiscovered below ground archaeological resources in developed areas would be an irreversible and irretrievable commitment of those resources. Archaeological surveys, avoidance through design, documentation, and other mitigation would be accomplished prior to development, so these impacts would be minimized.

Loss of historic material from alteration of historic structures, features, or landscapes would also be an irreversible and irretrievable commitment of resources. Sensitive design, documentation, consultation with the State Historic Preservation Officer, design of new features to maintain the character of existing historic material, and other mitigation would be accomplished prior to development so these impacts would be minimized.

Irrecoverable and irreversible commitments of prime farmland and hydric soils would also occur under the action alternatives with placement of new buildings and/or parking. The amount lost is negligible in comparison to the overall availability of these soil types within the area.

In addition, limited amounts of non-renewable resources would be used for construction projects and park operations, including energy and materials. These resources are also irreplaceable and irretrievable once they are committed.

4.9.4 Impairment

As stated at the beginning of this chapter, impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including opportunities that otherwise would be present for the enjoyment of those resources and values. An impact would be more likely to constitute an impairment to the extent it affects a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- Identified as a goal in the park's general management plan or other relevant NPS planning documents.

Impairment may result not only from NPS activities in managing the park, but also visitor activities, or activities undertaken by concessionaires, contractors, and others operating in the park.

The only potential threat of impairment is contained in the No Action Alternative; in which continued housing of the NPS portion of the Jamestown collection in the basement of the Visitor Center could lead to impairment through damage and/or destruction of the collection.

Some impacts may be considered individually adverse and major, but overall, none of the alternatives would result in adverse, major impacts to park resources or values. Therefore, none of the action alternatives, if appropriately mitigated as described, would constitute impairment. The significant resources and values would be left unimpaired for the enjoyment of future generations.

4.9.5 Conclusion

Overall, the alternatives differ in the opportunities they provide and the levels of impacts associated with implementing those alternatives.

Alternative A would result in a continuation of current conditions at Jamestown Island. The NPS portion of the Jamestown collection would be in danger of damage or loss during heavy storms; no improvements to the interpretive program would be made; and operations and infrastructure would be inadequate to support future demands. As 2007 approaches, Jamestown Island would miss out on an opportunity to draw and educate increased numbers of visitors.

The action alternatives share many resource protection elements, while their respective approaches to interpretation and visitor services are substantially different in scope and scale. Consequently, some impacts are similar, while others differ in nature and magnitude. For instance, Alternative D generally has the fewest impacts to natural resources because it lacks development at Neck of Land. Alternative B, on the other hand, has the greatest beneficial impacts to research, education, and partnerships as it provides for joint APVA/NPS collections and opportunities for seeking new partners (i.e., water taxi, concessions, and research/monitoring of natural resources).

Partnerships

Alternative B offers the greatest number of venues to visitors and has the most benefits to partnerships. In addition to offering the greatest benefits to other partners, Alternative B would seek to strengthen the APVA/NPS partnership by combining collections, research, and curatorial facilities in an expanded Jamestown Rediscovery™ Center. Additionally, Alternative B, as well as Alternatives C and E, would provide an Intermodal Transportation Terminal at Neck of Land that would help to introduce visitors to the area and to both Jamestown Island and Jamestown Settlement, as well as provide a hub for moving between various areas of the site.

Alternatives B, C, and E would strengthen partnerships with major institutional and agency partners through new research ventures; however, the APVA/NPS partnership would remain strained under Alternatives C and E due to separated collections, research areas, and common spaces.

Resources and Environment

Each of the action alternatives would improve preservation, interpretation, and maintenance of the site's cultural and archaeological resources. Construction throughout the site, particularly in Alternatives B, C, and E, would affect known and unknown archaeological sites, and an APVA or NPS archaeologist would be present to ensure protection of archaeological sites and catalog any new finds. Impacts to historic buildings, structures, and cultural landscapes would range from negligible to major; however, mitigative measures would be employed to minimize adverse effects.

With regards to the Jamestown collection, all action alternatives seek to further protect the artifacts and archives from damage or loss. Overall impacts would be both beneficial and adverse, ranging from minor to major.

Alternatives B, C, and E would have similar impacts to a variety of natural resources, including wetland and upland habitats, floodplains, Chesapeake Bay preservation areas, threatened and endangered species, and water and air quality. Overall, impacts to these resources range from negligible to minor, with the exception of visual quality and aesthetics (minor to moderate impacts).

In all cases, for both cultural and natural resources, design considerations, best management practices, and mitigative measures would be employed to minimize impacts to resources.

Research and Education

Alternative B best achieves both APVA and NPS research and education objectives. Alternatives C, D, and E meet some of the objectives, but only

Alternative B would allow for optimal collaborative research and educational programming. This alternative would include a joint campus, the replacement Visitor Center/educational facility, with facilities to support both the research and educational arms of the learning center. In addition, the collections of both organizations would be housed together at the expanded Jamestown Rediscovery™ Center. Along with these facilities would come many benefits – joint collections, staffing interactions, ease of access for researchers, and more coordinated management and interpretation. With the facilities to support an early American historical archaeology research center, Jamestown could become recognized as the premier 17th century research facility in the United States. In addition, the educational benefits of this alternative would include dedicated education space, easy access to the site for education groups, and exhibit areas providing opportunities for students to comprehend the Jamestown interpretive themes.

Visitor Experience

Alternative B would best enable the NPS and APVA to achieve the goals identified in the *Jamestown Long Range Interpretive Plan* (Colonial NHP 200b) and the *Haley Sharpe Jamestown Island Interpretive Plan* (2001b) regarding the visitor experience. Under this alternative, the greatest number of interpretive opportunities would be available to visitors during pre-visit, approach, and on-site experiences. The comprehensive use of a variety of media with direct relationships to natural and cultural resources would maximize the presentation of primary themes.

Most of the beneficial effects of Alternative B would also result in Alternatives C, D, and E. However, under Alternative C, the disconnected replacement Visitor Center at Neck of Land would greatly reduce visitors' time on the Island, diminishing the possibility of a seamless interpretive experience. Alternative D's lack of boat access and alternative transportation options to the Island would limit visitor understanding of the relationship of the

cultural and natural resources. The reduced square footage of the Observation Building in Alternative E would limit interpretive and artifact display space.

Operations

The impacts to NPS operations under action Alternatives B, C, and E would be the same. The increased visitation to the Jamestown area and the development at Neck of Land and on the Island would result in major impacts to NPS operations. All phases of the Park's operation would need substantial increases in both staff and funding in order to accomplish the Park's mission. Alternative D would have the least impact on the Park's operations but would require some additional staff and funding. All of the alternatives would provide increased visitor contact and an enhanced interpretive experience.

For the APVA, impacts to operations would vary from minor to moderate. Under all alternatives, the APVA believes the volunteer program could be expanded to help provide additional visitor assistance.

Buildings and Utilities

All of the action alternatives require improvements to the utility infrastructure at Jamestown. Taken together, the improvements required under each alternative would result in a comprehensive and modern system of water/sewer, stormwater, electrical, and communications infrastructure. In addition to serving the utility needs of specific improvements, the development of a more complete system would be a positive cumulative impact.

Transportation and Site Access

Future year evaluations for the action alternatives determined that traffic operations on the Colonial Parkway would operate at acceptable levels even during peak season, design day conditions with all action alternatives. The presence or lack of a Colonial Parkway shuttle would not significantly change traffic operations or levels of service. Parking demand would also be accommodated in all alternatives studied.

The water taxi service proposed in Alternatives B, C, and E has significant potential to attract ridership between the Neck of Land parcel, Jamestown Island and, in Alternatives B and C, Powhatan Creek Overlook. The NPS would need to determine how the cost for this service would be paid, and whether all or a portion of the projected operational costs, would be subsidized in an increase in admission to the major Island attractions.

With Alternatives B, C, and E, the development of a comprehensive way-finding sign program, including the use of variable message signs, would be needed to minimize visitor confusion and to maximize the use of parking lots at both the Neck of Land parcel and on Jamestown Island.